THE

ELECTRICAL REVIEW.

VOL. XCI. AUGUST 11, 1922. No. 2,333.

ELECTRICAL REVIEW.

Vol. XCI.] CONTENTS: August 11th, 1922. [No. 2,333.

	Page
The Registration of Contractors	181
Alexander Graham Bell	182
The Exhibition of 1924	182
Wireless Telephony	182
The Engineering Joint Council	183
Co-partnership in Industry	183
French Hydro-electric Plant	183
Ball Bearings for Tramcars	183
False Marking and Description of Goods, with Special Reference to Origin, by Theodore Rich (*continued*)	184
The Electrical Equipment of the London County Hall (*illus.*) (*concluded*)	186
Why ? by S. Lees	189
A Simple and Inexpensive Method of Testing Induction Motors, by F. A. Cook (*illus.*)	192
Water-power for the Farm, by W. Francis Lloyd	192
The Electrical Exhibition of 1924	193
Parliamentary Notes	194
Correspondence—	
Wireless Valve Sets	194
Removal of Static Charge	194
Belgian Electrical Signalling Apparatus	194
Small Private Generating Stations	195
A Proposed Christian Order of Industry	195
Business Notes	195
Notes	200
City Notes	204
Stocks and Shares	205
Market Quotations	206
Electric Lighting in the Near East, by E. J. Hawkins	207
Mineral Sulphides as a Source of Electric Energy	208
Norway's Electric Power Programme	209
Automatic Train Control	210
Merz-Price 66,000-V Protective Gear with Beard-Hunter Compensated Pilot (*illus.*)	210
The Manufacture of Electrolytic Iron	211
Wireless Telephony	211
Reviews	213
Comparative Tests on Tramcars	214
Legal	215
New Patents	216
Published Specifications	216
Contractors' Column	Advertisement page xxviii

"ELECTRICAL REVIEW" SUBSCRIPTION RATES.

UNITED KINGDOM	**£1**	**14**	**8 per annum.**
CANADA	**1**	**12**	**6 do.**
COLONIAL and FOREIGN	**2**	**1**	**6 do.**

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Published every FRIDAY, Price 6d.

The Oldest Weekly Electrical Paper. Established 1872.

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OFFICE, 4, LUDGATE HILL, LONDON, E.C. 4.

Telegraphic Address: "AGEKKAY, CENT., LONDON." Code, A B C. Telephone Nos.: Central 8260 and 8261.

The "Electrical Review" is the recognised medium of the Electrical Trades, and has by far the Largest Circulation of any Electrical Industrial Paper in Great Britain.

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THE REGISTRATION OF CONTRACTORS.

A SPECIAL Committee of the Institution of Electrical Engineers recently considered the question of pressing for the compulsory registration of electrical contractors; this idea has been abandoned, but in its place a scheme is under consideration for voluntary registration. The proposal is to establish a "Registration Authority" as a corporation under the Companies Acts, which shall be composed of representatives of the I.E.E., the Royal Institute of British Architects, the Electrical Contractors' Association, the various electricity supply undertakings' associations, the B.E.D.A., the B.E.A.M.A., and certain others. The Authority is to possess the power of registering contractors and of laying down regulations to which electrical installation work must comply, and is to see that the registered contractors comply with such regulations.

In order to keep a close watch on the industry, Local Advisory Committees are to be constituted in various districts, consisting of one representative of the Supply Authorities, one of the I.E.E., and one of the Electrical Contractors, and these Committees are to look into the applications and advise as to the suitability of an applicant for registration. As regards the electricity supply undertakings which carry out wiring work, such undertakings are eligible for registration on condition that they include in their application the name of their manager, who must have certain qualifications. He must either have carried on business as an electrical contractor over five years, or have acted as a charge hand for a firm for such period, or have passed the final examination of the City & Guilds College for installation work, or some other examination of the same kind approved by the Registration Authority.

Needless to say, there is very decided opposition to the proposal in some quarters, and it is questionable whether some of the supply industry associations will support the proposals and be represented. It is obvious that if such associations are represented on the Registration Authority, they commit their constituents to support the registered contractors as against unregistered contractors, and so go a long way towards identifying the present scheme with the compulsory registration scheme.

The proposal on the lines suggested would be very far-reaching indeed. It would make the electrical contracting industry a "closed" industry. There is, of course, something to be said in favour of this. Everyone will naturally appreciate the difficulty that first-class contractors have when competing against irresponsible wiring firms which do shoddy work at cut prices, are always on the verge of bankruptcy, and are constantly fizzling out as one firm and reappearing as another. Registration by a responsible authority would tend to checkmate these undesirables. On the other hand, it would

make the trade, as we have said, a "closed" industry, and to a certain extent an artificially restricted one. From this point of view the proposed registration is directly against the interests of electricity supply undertakings, and to some extent against the interests of the public, since the obvious effect will be to keep prices up, especially if more "regulations" are laid down by the Registration Authority. Also the coupling of the registration of an electricity supply undertaking with its manager's name (making it dependent upon the continued employment of such managership for its registration is obviously open to objection.

But there is another and more fundamental objection from the supply undertakings' point of view, and that is, the saddling of supply undertakings with new responsibilities. At present the wiring of a house is a matter entirely between the consumer and the electrical contractor; the supply undertaking has nothing whatever to do with this. On the other hand, if the supply undertaking is represented on the Registration Authority and also on the Local Advisory Committee, the undertaking is possibly involved over the contractor chosen, and perhaps is brought into conflict with its prospective consumer over a matter in which it has no interest whatever. (It will be remembered that this was one of the difficult situations created by the trade-union action in refusing to couple up installations carried out by non-union labour.) Also the undertaking would be brought into conflict with the smaller contractors in the town who did not register, but who might be doing most valuable service to the undertaking by bringing in new consumers. In the case of municipal undertakings, the last consideration might lead to a very difficult situation, since such contractors, or men interested in such unregistered contracting work, might be quite big ratepayers and members of the Council. And all this possible friction would arise with no gain to the undertaking, but rather the reverse.

Then as regards the imposing of fresh regulations for wiring work, here, again, at present the undertaking takes no responsibility; its only concern is whether an installation is likely to cause trouble to the general circuit. On the other hand, if an undertaking is represented as suggested on the Registration Committee, it is once again faced with responsibilities. The undertaking has to see that installations comply with the rules of the Registration Authority, and has to interfere in a matter which does not concern it and on which it has no power to enforce its views. The undertaking would again be brought up against prospective consumers with no advantage to itself. As we have pointed out, therefore it is from the electricity supply industry that the chief objections will arise. So far as other Associations are concerned, such as the Royal Institute of British Architects, they, of course, have no immediate concern; the question does not materially affect their interests, and they can go to sleep on the Registration Authority. But the case is quite different with electricity supply undertakings, and as they are the chief section and the one whose support is really indispensable, it looks as though the proposed scheme has but little prospect of maturing.

Alexander Graham Bell.

If we may assume the possibility that anyone should be so far interested in the telephone as to be familiar with the extent of its use throughout the world, yet ignorant of its history, it must be matter for surprise not that the inventor is dead but that his death should only now have occurred. There is probably no prior example of so great a result from one man's work in that man's life time. Bell himself was ever ready to draw a distinction between his own share and that due to others. He gave public expression to the fact that the great developments in telephonic progress resulted from the work of many minds, but those many minds and many more besides, recognise that the basis of the whole fabric was the work of Bell himself. It was accomplished under difficulties and discouragements, but with the confidence and perseverance which come from the combination of superior knowledge of principles and something of the vision of the seer. Not fortuitous accident and very little lucky experiment contributed to his results. His was an invention of the mind, and promptly recognised as such. It was on its first introduction to this country that Lord Kelvin bore striking tribute to its merits, and expressed admiration of the hardihood of invention which devised such simple means for realising a mathematical conception. To Alexander Graham Bell the world owes a deep debt of gratitude. He will be mourned as one who accomplished much, yet asserted himself not at all. We condole with his family, his friends, and his associates in their loss.

The Exhibition of 1924.

Elsewhere in this issue we publish an article dealing with some of the arrangements that have been made in the preliminary stages of the organisation of the electrical and allied engineering section of the Empire Exhibition, which promises to command world-wide attention the year after next. We have already given a few particulars gleaned from different sources, and we are now able to give information drawn from the fountain head. It may be considered by some to be unfortunate that the material is only made generally available in what is really the height of the holiday season, when so many men are away or are preparing to leave for their vacation. It may have been available for the firms who are members of the B.E.A.M.A. for some time past, but electrical and allied firms who are outside the circle if they wish to have exhibits at Wembley Park, should promptly put in their applications for space.

Wireless Telephony.

The report of the Radio Research Board's Sub-Committee, which is referred to in some detail elsewhere in this issue, on the subject of the present position of wireless telephony in this country has been published at a critical moment. At a time when the subject is exciting so much general interest, and when the Postmaster-General, in collaboration with the principal manufacturing concerns, is attempting to initiate a broadcasting organisation, the views of this expert sub-committee are particularly pertinent.

Briefly, the conclusions come to are that wireless telephony over long ranges is in an extremely elementary stage, and no line of development is to be seen which would be likely to lead to its establishment on a commercial basis within a measurable period.

For medium-range working it is considered that in remote localities, where atmospheric and other interference is not excessive, it would be possible to establish non-secret wireless telephonic services using waves of the length usually employed by medium-power wireless telegraph stations of the same range. The power necessary for wireless telephony would, however, be much greater than that required for satisfactory communication over the same distance by means of wireless telegraphy.

In the case of short-range communication, the position is apparently more hopeful; it seems that the experimental work in the use of short wave-lengths of the order of 100 and 20 metres is expected to lead to the development in a reasonable time of a system of wireless telephony that will approach, approximately at any rate, to the requirements of a commercial system. There seem to be, however, few prospects of the latter being satisfied to anything like the same degree as is done by a land line, at any rate in the near future.

As was to be expected, the Sub-Committee finds itself unable to recommend the use of wireless telephony as a substitute for any other means of telegraphic communication, except in those cases where the special requirements cannot be met economically in any other way. An example of the commercial utility of wireless telephony is the broadcasting of intelligence for the

general benefit of the community, and it may also be convenient in the Fighting Services, shipping circles, &c., whenever secrecy is unimportant. But considerations of mutual interference—quite irrespective of anything else—rule out the use of the wireless telephone as a means of local communication. Probably its most important applications on a commercial scale are as a connecting link between ordinary land-line telephone systems and as a means of communication with isolated posts.

Finally, it is of interest to note that the Sub-Committee does not expect that the development of wireless telephony will be found to have been carried much, if any, further abroad than it has been in this country.

The Engineering Joint Council.

The formation of an Engineering Joint Council which is announced this week to co-ordinate certain functions of the leading engineering institutions, is an event of importance, and should lead to a better state of affairs in the science and profession of engineering as a whole.

To electrical engineers especially this should prove very valuable, having regard to the extent to which their functions encroach upon, or rather are inseparable from, all other branches of engineering. The object placed first in the list of purposes for which the Council has been formed is "to improve the status of engineers." This is of course one of the principles of all the constituent bodies, and it is apparently considered that the combined strength of these societies will have an important effect upon the position of their members. Another object is "to secure . . . the appointment of properly-qualified individuals to responsible engineering positions." This is a point closely associated with the question of status. The existence of such a Council may lead those who have the disposal of engineering appointments to use their power as a means of securing the best men, but there is no certainty that they will do so. The Council will not actually be able to "secure" this object, but as an advisory body it will be able to influence to a great extent the selection of engineers. We think that the last-named object of the Council will be of the greatest immediate advantage, *i.e.*, "to prevent the unnecessary duplication of activities." At the last annual dinner of the Junior Institution of Engineers, Mr. C. H. Wordingham complained of the vast amount of "proceedings" issued by the various engineering societies, in which duplication and overlapping were too often prevalent. Mr. Wordingham is an old apostle of institutional co-ordination and an opponent of technico-literary duplication, and on the occasion mentioned he was quite consistent in suggesting the compilation of a serial work, combining in itself all the best of each body's papers and discussions. Such a work would cover the activities of societies of all nations. Perhaps the Council will be able to operate earlier and reduce at the source the number of papers dealing with the same subject. We hope that every success will attend its efforts to make the engineering profession a "power in the land."

Co-partnership in Industry.

The speech of Lord Leverhulme at Port Sunlight should not be overlooked by anyone interested in industrial developments of the best sort. Throughout the speech he invariably addressed his audience as his "co-partners," as he is in a position to say that everyone employed by his vast organisation is a partner in the business and interested directly in the profits earned. The speaker appeared once again as a practical organiser losing no reasonable opportunity of making profits while at the same time showing himself to be prepared to utilise any possible chance for improving the position of those connected with the business. He laid great stress upon the contrast between the enormous development of applied science on the one hand and the halting unsatisfactory progress in the application of political economy on the other. In his view the world of men has not advanced equally with science with regard to its schemes of humanity. He spoke of the beginnings of co-partnership and of the contempt that was meted out to its pioneers by most of the leading industrialists of their day. Lord Leverhulme has believed in profit-sharing from the time he was a young man, and he has consistently applied it to his business. His company is now introducing benefits for all the co-partnership workers in the business on a generous scale, and absolutely as a free gift, without any contribution from the employé, but leaving unimpaired the company's rights of suspension and dismissal of any individual. Briefly summarised, the benefits now to be conferred are as follows:—

During unemployment, owing to slackness of trade, a co-partner will receive such an addition to the State allowance as will make up his total receipts to half pay.

In case of illness, full pay will be given for four weeks or longer at the discretion of the company.

Each co-partner will be presented with a life policy of, at least, £100, and the company will pay subsequent premiums.

The amount of the policy increases in value according to the grade of employé or official interested until it reaches a figure of £1,000 in one class, £2,000 maximum for foremen, and £4,000 in the case of managers and directors.

Arrangements are also made by which if a co-partner retires, or leaves the company for any other reason, he will in ordinary circumstances be able to take his life policy with him, and by continuing the premiums on his own account retain all its advantages.

Lord Leverhulme gave the credit for the details of this scheme to his colleagues, but they in their turn declared that the honour rested with himself.

French Hydro-Electric Plant.

The French Minister of Public Works, recently replying to questions, stated that the total plant installed at hydro-electric works at the end of the war amounted to 1,500,000 h.p. At present the plant is estimated at 2,100,000 h.p., of which electrometallurgy represents 1,300,000 h.p. and traction 50,000 h.p. The capacity of the works in progress and to be completed in the next two years will be about 300,000 h.p. Since 1918 electric traction has only been placed in service on certain lines of the system of the Southern and the State Railways, the total length being 75 miles; but the works begun in the meantime will soon permit of the use of this method on a number of important lines. The Minister said that it is calculated that within a period of five years, lines of a total length of 930 miles belonging to the systems of the State, the Paris-Orleans, the Paris, Lyons and Mediterranean and the Southern railways will be electrified. The general programme of electrification of the railways provides for the completion of 5,500 miles of line in from 15 to 20 years.

Ball Bearings for Tramcars.

The mounting of the main wheel axles and motor armature shafts of tramway cars on ball or roller bearings is no new idea. Some 20 years ago the whole of the Southport tramway undertaking's cars were so fitted, and they continued to function satisfactorily, after certain initial troubles had been overcome, until the day when the undertaking was taken over by the Corporation. As a result of the adoption of roller bearings in the case cited, friction was reduced by such an extent that one man could push a car along unaided, and the power consumption on that system was one of the lowest in the country—under 0.6 kWh per car mile.

For some reason, however, the fitting of ball or roller bearings on tramcars has not become general practice. That decided advantages and economies are bound to follow the discarding of the plain bearing there is no doubt, and it is therefore appropriate to draw attention to certain National Physical Laboratory tests which are outlined elsewhere in this issue.

The reduction in the consumption of electricity of 22 per cent. per car mile which it is possible to bring about by the adoption of roller bearings would in itself seem to be sufficient to justify the condemnation of the present type of plain bearing.

D

FALSE MARKING AND DESCRIPTION OF GOODS WITH SPECIAL REFERENCE TO ORIGIN.

By THEODORE RICH.

Part II.—The Merchandise Marks Acts.

The Act of 1887 was the first comprehensive effort to promote common honesty in the marking and description of goods; its detractors have called it a protectionist measure, as if it was wrong to take steps to prevent "Free Fraud." It must be remembered that it was not merely intended to prevent foreign goods from being marked and described as British, to prevent goods from one district at home being sold as if they came from another, one maker's goods being sold as if they were made by a firm with a better reputation, but also to prevent, for instance, German goods being sold as French on the British market or in markets supplied through British trade centres.

In 1890 the Deputy Chairman of the Board of Customs said (paragraph 26): "The Act is not merely directed against what is to the detriment of the British manufacturer, it is against all false marking. To a certain degree it protects the French manufacturer against German imitations, and *vice versa*." (Paragraph 189): "The Act is of great importance to foreign countries as well as our own. It is an every-day occurrence to have goods coming from Germany with descriptions in French; we detain them (if not marked with the country of origin) just the same as we should if they were marked with descriptions in English."

There is no doubt that for a time at least the Act did a good deal to promote honest trading, not merely at home, but also all over the world, many of the sections being introduced into Colonial Acts. It is lamentable to note that after 30 years of alien infiltration and persistent wirepulling, some of the useful clauses have been set at nought by departmental instructions, and that we are now lagging where we ought to be leading.

The most persistent opposition and ridicule which has been offered to this Act and the minor amending Acts has been on the part of those who take up the attitude that, provided a certain practice leads to more profit, it must be legitimate, any criticism being met with the convenient excuse that "many others in the trade do it."

Certain proposals for strengthening the Act are now before Parliament; they will be dealt with later.

Clauses in the Act.

The Act deals, in Section 2, with the forgery of trade marks and with every person who "applies any false trade description to goods," persons so doing being liable, on conviction or indictment, to imprisonment for two years or a fine, or both, and on summary conviction, that is before a magistrate, to four months' imprisonment or twenty pounds fine, with an increasing punishment for a second conviction, the offending articles to be forfeited.

In Section 3 the expression "trade description" means any description, statement or other indication, direct or indirect, *inter alia* (*b*) as to the place or country in which any goods were made or produced.

The expression "false trade description" means one which is "false in a material respect as regards the goods to which it is applied, and includes every alteration of a trade description, whether by way of addition, effacement or otherwise."

According to Section 5 a person shall be deemed to apply a trade mark or trade description who—

(*a*) applies it to the goods themselves;

(*b*) applies it to any covering, label, reel, or other thing in or with which the goods are sold or exposed;

(*c*) places, encloses, or annexes any goods which are sold or exposed or had in possession for any purpose of sale, trade, or manufacture, in, with, or to any covering, label, reel or other thing to which a trade mark or trade description has been applied;

(*d*) uses a trade mark, or mark, or trade description in any manner calculated to lead to the belief that the goods in connection with which it is used are designated or described by that trade mark, mark, or trade description.

Section 10.—In the case of imported goods, evidence of the port of shipment shall be *primâ facie* evidence of the place or country in which the goods were made or produced.

Section 16 provides for the prohibition of importation of goods which, if sold, would be liable to forfeiture under the Act. Under sub-section (1) goods of foreign manufacture are prohibited which bear any name or trade mark being or purporting to be that of any manufacturer, dealer, or trader in the United Kingdom unless such name or trade mark is accompanied by a definite indication of the country of origin. Sub-section (4) is directed against cases in which there is a name of any place on the goods identical with or a colourable imitation of the name of a place in the United Kingdom, unless such name or trade mark is accompanied by an indication of the country of origin.

By an amending Act in 1891, Section 1, the Customs' entry relating to imported goods was deemed, by Section 2, a "trade description" applied to the goods, and the Board of Trade was authorised to prosecute offences in cases "appearing . . . to affect the general interests of the country, or of a section of the community, or of a trade." In 1894 the Board of Agriculture was authorised to act in certain cases. A further Act in 1911 deals with the furnishing of information by importers.

The sections of the original Act which have given rise to the most controversy are those dealing with place or country of origin, and the application of the Act to foreign goods in transit. It can be well understood that where articles have English words on them, or connected with them, in the absence of other indication, the buyer thinks that they are British, and, in accordance with the Act, goods having such words have to be marked with the country of origin.

It never has been part and parcel of the Act that all goods should have the country of origin marked on them. It is not unlawful for a dealer in the United Kingdom to put his name on to such goods, provided that the application does not result in a misunderstanding as to the maker of the goods or the country of origin.

Originally goods in transit were examined by Customs to see if they complied with the Act, but owing to the action of merchants who cared more for their own pockets than for national reputation, this practice has been abandoned by departmental order. This question will be dealt with later.

"Made in Germany."

Very clever propaganda has for years been organised by friends of "false trade description" to prove that the progress in German trade has largely been due to the provisions of the Merchandise Marks Act regarding marking of goods, which have enabled the foreign buyer to know where the goods handled by British merchants have come from, so that he could go to Germany or to some German merchant and buy them direct. There may be something in the argument, but nothing like that which is claimed by Germanophile merchants.

It is necessary to deal with this matter in some detail, as the same arguments are indulged in at meetings and committees regardless of a number of elementary factors which have influenced trade and business during the last forty years. In the first place, the average British merchant, unlike the merchants in many other countries, has for years given very little preference to British goods. He not merely often puts his own mark with a London address on foreign goods, called conveniently a "selector" mark, which in fact often does deceive as it is intended to deceive the ultimate purchaser, but he also frequently illustrates foreign goods with the aid of foreign blocks in his catalogues.

To put so much of the blame on the Act is to assume that the German commercial traveller, the German subsidised lines of steamers, the German subsidised clerks and agents in banks and business houses at home and abroad, the German Trade Press and catalogues have been non-existent, and also that the foreign merchant is an untravelled, non-observant, ignorant person.

Suppose the case where a British merchant has begun to build up a business with German goods with one of the hardware and machinery local merchants abroad; whether the goods have been marked "Made in Germany" or not, a German commercial traveller or local German business man, being an expert, will probably sooner or later spot the goods, in the warehouse or in the retailers' shops, and he then will offer the goods direct at a lower price. A man with experience in a particular trade can often spot not merely the country of origin, but also the maker of an article without looking at the label. In the old days before technical and trade journals, the telegraph, railways and steamships existed, the merchant was a very important link in the commercial chain. To-day there is a tendency for the consumer to get close to the producer, and for a manufacturer to appoint his own agent abroad. It is usual nowadays for some members of foreign firms frequently to come to Europe and visit London, Paris, Hamburg, and Berlin, where they are shown samples of the very goods they used to buy through London merchants.

The Influence of Merchants.

The merchant is not in the strict sense of the word a producer, he is either a commission agent or a vendor middleman; he can only justify his existence if he finds out or creates markets and demand for goods which but for his business would not otherwise exist, or gives facilities to his customers otherwise unobtainable. Many of those merchants who demand freedom of trade from the housetops, object to the marking of goods, otherwise freedom of information; they often show by their protests before marks and similar committees and their influence in Chambers of Commerce that but for secrecy regarding sources of supply they would lose some of their business, and quite properly too. Trade is hampered by the presence of too many intermediaries.

A country which cannot feed itself cannot live on *entrepôt* trade and merchants' commissions; it must either export competitive goods or minerals in return for food, or starve; matters are made worse in this country by the destruction of much of the invisible exports owing to the debt to the U.S.A. A merchant is entitled to handle German or any other foreign goods; we cannot export without imports, but a merchant who makes extra profits by facilitating self-deception by ultimate or other buyers should be severely dealt with.

At the present time, more than ever before, the interests of the manufacturer and operatives come before those of the middleman, although the last has had, and still has, very much too much say regarding national affairs.

Limitation of Dishonesty not "Protection."

To claim that national trade will be injured by the limitation of dishonest trade is to give a very poor testimonial to the nation as a whole, although some people in high places do not seem always to realise that a great deal of the "goodwill" of British trade rests on the "square deal." Dishonest action regarding the origin of goods injures everybody in the long run. The difficulty is that British law was founded on a basis of liberty and fair play; for example, an accused person is assumed to be innocent, on the assumption that the citizen, when left alone in his individual and collective capacities, would act honourably. Unfortunately during the last half century the country has been flooded with alien merchants and others, with alien interests to support, many of whom have apparently never been taught to play the game; so not merely have unfair practices been winked at and encouraged all round, but influence has been brought to bear to prevent the Customs and other Government departments from interfering with some of them. It is most amusing how the word protection, when used in any sense, seems to give some people a cold shudder, especially those who seem so anxious to increase their own profits regardless of the interests of the community as a whole.

Lord Russell of Killowen, in the case of "Kirschenboim *v.* Salmon & Gluckstein," said: "The buyer is entitled to know what he is buying, and to have that which he orders and pays for."

A witness before the 1890 Committee said (No. 2314), "We only want the public to know really what they are buying, and to-day they do not. . . . We want simply fair play for the British industry." In paragraph 2461, "no doubt from a moral point of view there is a great desirability that the well-earned reputation of a particular market should be preserved as far as possible for that market."

2474, "The (1887) Committee took evidence and was satisfied that frauds existed to an enormous extent, and that the reason of the fraud was that the goods had no indication of origin, or a false indication of origin." 2476. "The Act was not passed for the purpose of protecting our industry against competition of cheap manufactures; it was to protect our industries against importation into this country of . . . manufactures alleged to be English which were foreign."

Some of those people who persistently deceive their ultimate purchasers at home or abroad, as far as the administration of the law allows, take up the attitude that to tell the customer what he is getting, or to insist that he shall not be deceived by advertisements, catalogues, trade cards, or "get up," is to adopt a system of protection. The matter then becomes "politics," and it should not therefore be discussed in respectable technical journals or by technical societies.

Deceiving the Ultimate Customer.

It should be remembered in all questions relating to the marking of goods, that it is not so much the merchant and wholesaler who should be protected—they have specialists to advise them; it is the small retailer and the ultimate customer. In a case in 1824, before special trade-mark legislation came into existence, this was pointed out.

The public has prejudices, it is no crime to have them; the trader has no right to take advantage of them in order to make more money. This is specially the case regarding natives in the tropics.

If goods are got up to look like British or French goods, in other words to deceive, it should not be necessary for a purchaser to have to ask what things are; and the law should be framed so that as far as practicable if a deliberate misstatement is made verbally or in writing the trader can be punished, so that he cannot merely wink at deception and then wriggle out.

It is more equitable to penalise an employer for the misstatements of his employés out of which he benefits than to hold him liable for the consequences of the negligence of his employés over whom he has nowadays so little control.

The Patriotic Buyer.

It is notorious that many of those who shamelessly profiteered during the war are using every underground means to prevent interference with profiteering, that is to say, by importing and selling German or Japanese and other foreign goods as British. If the average English customer is shown two pocket knives, two lamp

holders, two samples of "flex" or cables, and he is told that one is British and the other is German or Japanese, he will only buy the latter if it is very much cheaper. The war has awakened in the large mass of the public a patriotic feeling, and many men realise that it is only fair that the buyer should know the conditions under which the goods he buys are made.

When the German Reparation (Recovery) Act was being drafted, which allowed of a tax up to 50 per cent. of the value of German goods imported, it was obvious that wholesale evasions would take place, the obvious safeguard being the adoption of the American system of compulsory marking of all German goods capable of being marked without injury, with heavy penalties for evasion, and, to protect the ultimate customer, penalties against deletion and false re-marking.

When the Bill was drafted, no clauses were put in making marking compulsory, although it was obvious that a large proportion of the population would only buy German goods at very much lower prices. The recent inquiry regarding German toys and the Safeguarding of Industries Act tended to show that while toy and fancy goods merchants might make perhaps 20 per cent. out of British-made goods, they often made 60 per cent. out of the German goods; therefore the incentive to deception is very great.

THE ELECTRICAL EQUIPMENT OF THE LONDON COUNTY HALL.

(*Concluded from page* 153.)

Cables and Wires.—It will be appreciated that the wide use which is made of electricity for lighting and power purposes in a building of this size has naturally necessitated a large scheme of conduit cabling. The Stella Conduit Co. supplied many miles of seamless steel screwed tubes of various diameters, and cast-iron boxes, all of which were specially made to comply with the strict conditions of the contract. A feature of the cabling is the neatness with which the cables have been run; from the main switchboards they are led *via* trifurcating boxes towards the roof of the basement, where they are supported in racks with ample clearance. The cables then radiate to points immediately beneath local control rooms, of which there are 110 on the various floors. The screwed steel conduit that protects the cable is concealed everywhere (to a large extent in air ducts).

Fig. 6.—G.E.C. Fittings in a Committee Room.

The actual total length of the main cables is some 3½ miles, and the complete contract for their manufacture and supply was entrusted to the Pirelli-General Cable Works, Ltd.

Three main classes of cable have been used in the installation—namely, paper-insulated, lead-covered, and steel-armoured cable; paper-insulated and lead-covered, but without steel armouring; and v.i.r. cable. In some positions three-core and in others twin-core cable is used. The sectional areas of the 3-core cables are 0.075, 0.12, 0.2, and 0.4 sq. in.; and the areas of the twin-core cables are 0.1 and 0.2 sq. in.

Hooper's Telegraph & India-Rubber Works, Ltd., furnished special pure rubber insulated flexible wire for use in the corridors, &c., and for connecting up certain fittings on the principal floor, as well as the wire for the electric clocks.

All the wiring for the lighting of the building was carried out by the main contractors and builders of the Hall, Messrs. Holland, Hannen & Cubitts, Ltd. The wainscotting in each room is screwed on; behind it is run an iron channel 1 in. deep and 2 in. wide, with a sprung-on cover. Any auxiliary leads for the room can be housed in this channel, so that should it be desired at some future date to alter or add to the lighting in any room, it can be accomplished without destroying the surface of the walls and floors.

Motors.—The whole of the motors used in the building, excepting certain lift motors, were supplied by Messrs. Crompton & Co., Ltd., and are generally of standard types. In a number of cases, however, such as the lift motors and those driving most of the ventilating fans, they have been specially designed to meet the requirements as regards silent operation, and the results are highly satisfactory. The panels to control the

Fig. 7.—Faraday Fittings in the Council Chamber.

motors were supplied by Messrs. Bray, Markham and Reiss, Ltd., and have been standardised so as to simplify the renewal problem. No less than 60 motors, aggregating some 350 h.p., have already been installed, and standardisation as far as possible is a feature of every phase of the work, being calculated to make for economy and simplicity in the maintenance of the plant.

Lifts.—In a large building such as the one we are concerned with, a complete system of lifts is a necessity, seeing that there are seven floors, a basement, and sub-basement. A total of 21 lifts have been installed, of which eight are service lifts, seven passenger lifts, four book lifts, and two goods lifts; their position are shown on the plan (fig. 1).

Messrs. Waygood-Otis, Ltd., were responsible for five of the large electric passenger lifts, two of which are capable of carrying a load of 42 cwt. at a speed of 250 ft. per min., travelling a height of 106 ft.; the cars

are 7 ft. 3 in. by 7 ft. 1 in. by 7 ft. 6 in. high. The three smaller ones will each carry 24 cwt. at the same speed, the cages being 5 ft. 3 in. by 5 ft. 6 in. by 7 ft. 6 in. high. The winding machines are of standard design. In the case of the larger lifts the ropes are six in number, and for the smaller ones four in number. The controller provides for smooth and gradual accelera-

Fig. 8.—Faraday Fittings in the Education Committee Room.

tion and deceleration. Provision is made against over travel in either direction.

The three smaller lifts, in addition to being operated from the car by an attendant, are fitted with a system of dual control, so that by a change-over switch the control can be altered to full automatic system. With this arrangement, after busy hours when the attendant is not available, any person can use the lift with ease and safety. The cars are fitted with screw grip safety gear under the car and operated by a governor which is set to actuate the gear in the event of the car attaining an excessive speed in either direction. The gear comes into action gradually and so avoids sudden shock. During the busiest half-hour in the morning one of these lifts carries 385 passengers. Flash light position indicators are fitted to all the lifts, and arranged so as to show on each floor the position of the lift in the shaft at any time.

The Express Lift Co., Ltd., supplied in all three passenger and thirteen goods lifts. Two of the former are capable of dealing with loads of 24 cwt. at a speed of 250 ft. per minute, and 20 cwt. at 300 ft. per minute respectively; the third passenger lift is designed for a 10-cwt. load at 150 ft. per minute. Twelve of the service and book lifts will take 1 cwt. at 100 ft. per minute, and the remaining unit is for 15 cwt. at the same speed. The control of this firm's lifts is also arranged for the lifts to be worked by the attendant on the car-switch system during rush hours, and automatically during slack periods. It should be noted that when automatic working is in force, the lifts do not work on the top speeds, referred to above, but on a second speed approximating to 120 ft. per minute.

The smaller goods lifts have a special form of full automatic push-button control, which enables them to be sent from and to any floor which may be desired. The governors are installed in the motor rooms, which are situated above the lift shafts. Should any of the lifts exceed the maximum speed in either direction, the speed governor operates a switch which brings the controller to the "off" position, thus cutting off the power supply to the motor and applying the brakes. If, in spite of this, the lift still travels at a speed above the normal maximum, the speed governor operates a trip which brings the safety gear into action; the lift is then definitely stopped within two feet. This type of safety gear ensures that a lift, even if travelling at a speed of 400 ft. per minute, can be brought to rest without causing any inconvenience to passengers.

An interesting point in connection with the installation of the lifts is that one of the goods lifts was erected and in commission within ten days in order to meet the urgent requirements of the L.C.C.

Lighting.—A large and handsome building such as the one we are concerned with must be equipped with electric light fittings, which must not only be efficient as lighting units, but must also be in harmony with the architecture and the scheme of decoration of the rooms. It should be mentioned that all the switches controlling the lighting circuits were supplied by the Edison Swan Electric Co., Ltd., flush-type tumbler switches being used in most cases; the larger units are controlled by knife-type switches concealed in the walls.

The whole of the lamps used, both vacuum and gasfilled, will be manufactured and supplied by English Electric and Siemens Supplies, Ltd. As the lighting arrangements are not yet finally completed, full particulars as to quantities and types cannot be given. The main feature from an illuminating engineering point of view, however, is that semi-indirect lighting units are employed in conjunction with gasfilled electric lamps.

In the Council Chamber, committee rooms, offices, and galleries, general illumination is provided by means of lamps in bowl fittings having glassware which effectively screens the brilliance of the filament without undue absorption of the light from the lamp. Thus, a highly efficient scheme of general illumination is obtained for a minimum current consumption. At the moment a large number of gasfilled lamps of 60, 100, and 300-watt

Fig. 9. Fig. 10.

Fig. 9.—Galsworthy Lantern at Terrace Entrance.
Fig. 10.—Bromsgrove Staircase Standard.

capacity are in use. For local or individual lighting, where it is necessary to supplement the general illumination, and for the corridors and minor appointments, standard vacuum-type lamps of 30- and 40-watt capacity are being employed. Some indication of the number of lighting points may be gathered from the fact that the total lighting load provided for is 750 kW, and from

ten to fifteen thousand lamps of various types will eventually be installed.

The General Electric Co., Ltd., manufactured a large number of fittings which were all specially designed in collaboration with the architect so as to be in keeping with the general architectural scheme. All these fittings have heavy cast bronze metalwork, and are equipped with various types of ornamental glassware.

The Entrance Hall may be considered as a typical example. Here cast bronze pendants, with 20-in. diameter "satin" finished glass bowls, are provided for the main lighting; the "Corona" suspension chains are also of real bronze, and lampholder covers of the same material are provided to hide the holders and necks of the lamps. Four torch fittings were also provided for this hall; each has four arms fitted with flambeau shades, and special provision is made for easy wiring and access for cleaning. The torch fittings are arranged for fixing to the mantlepieces. The fittings designed for the lobbies of this entrance hall are somewhat unusual. Owing to low headroom, pendant fittings would have fouled the doors when the latter swung open. A special bronze ceiling fitting with a shallow "satin"

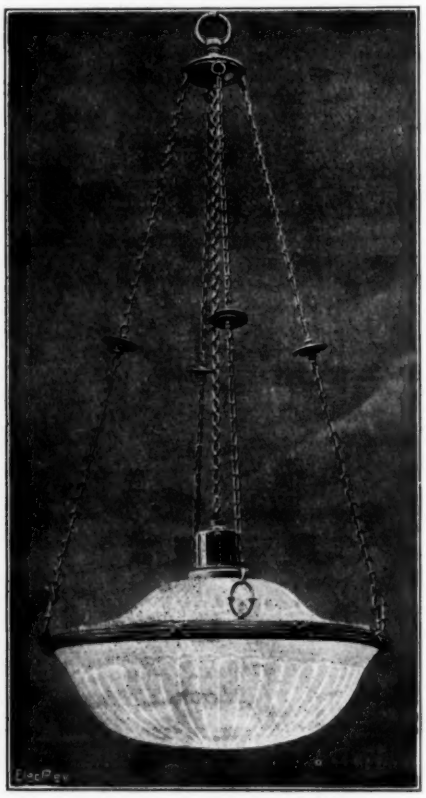


Fig. 11.—Osler Dish Pendant.

finished glass dish was therefore designed, the top reflector with the lampholder being sunk into the roof, allowing the cast band carrying the dish to be flush with the ceiling.

The Tea Room and Library are equipped with pendants similar to those in the entrance hall. The members' reading and refreshment rooms derive their main illumination from eight bowl fittings, each equipped with a 24-in. "Perlux" dish. The combination of this beautiful glass with the rich bronze mounts gives a most striking effect, which is not spoiled as so frequently happens by a view of the lampholder and lamp neck—these being hidden by bronze tassels. Subsidiary lighting in these rooms is provided by 12 bronze wall brackets with octagonal backplates. Each has two arms carrying "Equiluxo" glass shades. Two "Perlux" bowl fittings of similar design to those already described, but 36 in. in diameter, and eight wall brackets are provided for the two large committee rooms, see fig. 6.

Messrs. Faraday & Son, Ltd., supplied the four large bowl pendants in cast and wrought bronze (each 5 ft. in diameter) for the Council Chamber (fig. 7); the massive six-branched electroliers and the two-light wall brackets for the Education Committee Room (fig. 8), as well as a number of obscured-glass dish pendants and two-light wall brackets for other positions of lesser importance; the firm carried out all the work in its London premises.

A handsome cast bronze lantern (fig. 9) was supplied by Messrs. Galsworthy, Ltd., for the terrace entrance lobby; this fitting is 4 ft. 9 in. high and 2 ft. 6 in. across its largest diameter. In addition, this firm provided 101 2-light Georgian wall brackets for the chief offices, and also a plainer pattern of bracket for the lavatories.

The elegant bronze standards on the fine marble staircase (figs. 3 and 10) were made by the Bromsgrove Guild, Ltd.; they are six in number and about 7½ ft. in height, each having an opal glass globe 22 in. in diameter, containing a 300-watt lamp. This firm is also executing the lamp standards and pylons for the main entrance, circular carriage-way, members' terrace, and covered-way; they are, however, not yet in position.

The last illustration (fig. 11) is of one of the 24-in. dish pendants supplied by Messrs. F. & C. Osler, Ltd.

In general, the offices are illuminated by ceiling lights, about 300 of which were supplied by Messrs. Best and Lloyd, Ltd.; they are fairly plain bowl fittings with chains and rings that harmonise with the doors and furniture of the rooms. The hundreds of yards of corridor have been lighted by small bronze ceiling fittings, to the number of about 500, supplied by the same firm, at the apex of each domed arch. The domes are of "satin" finished opal glass, as is the case with all the lighting glassware throughout the building.

Some 600 sphere pendants have been supplied by Messrs. Paul W. Rands.

Clocks.—Practically every room in the building will have one or more electric clocks in it. There are at present some 700 dials in use, each circuit of 100 being controlled by a master clock, the energy being derived from a Chloride battery. The clocks were supplied by Messrs. Gillett & Johnson.

Telephone Exchange.—Of interest is the fact that the County Hall houses a busy telephone exchange, in which the 10-position switchboard is provided with 35 lines in and out of the building, and no less than 650 internal extensions. The exchange is a war-time relic, inasmuch as it was originally installed by the G.P.O. for the use of the Food Controller when he and his staff occupied the unfinished building. It has since been adapted to L.C.C. requirements, but the existing equipment is only temporary, for it is intended to substitute for it within eight months' time, it is hoped, an automatic exchange to deal with anything up to 900 instruments. When the conversion has been made this will be the first private automatic exchange in London to be connected directly to a public P.O. exchange and the largest of its type in the country.

Annunciators.—The London County Council is much like a small Parliament—it has its whips and its division lobbies, &c. So also must its members—wherever they may be—be informed of what is passing in the Council Chamber when a debate is in progress. To provide for this requirement a system of "division bells" and annunciators, similar to that in use in the House of Commons, has been installed.

The whole of the apparatus supplied by the Sterling Telephone and Electric Co., Ltd., in this connection was specially constructed, and consists of division bells for the purpose of calling the members together when a division is about to take place in the Council Chamber. The installation consists of about 80 bells fixed about the premises, in corridors, committee rooms, the library, refreshment bar, and at any point where members are

likely to assemble. They are of a somewhat novel construction, and differ from the ordinary type of electric bell.

An electromagnet provided with the usual form of armature and hammer is fitted, with the striker resting between two 4-in. cone-shaped gongs; the movement is a single-stroke one. When the circuit is closed the armature is attracted and the hammer strikes one gong; when the circuit is broken the armature is released, the hammer falls back and strikes the second gong. This cycle of events takes place about once a second, and the gongs being tuned in thirds, the result is a pleasant non-irritating, but none the less persistent, ding-dong. There is practically no part of the building in which the bells cannot be heard.

The controller for operating the bells comprises a small motor mounted on an iron bed plate, and geared to a shaft which carries ten substantial brass cams, each one of which is arranged, when revolving, to make contact with a hinged contact arm. The bells are arranged in ten sections, the circuit of each section being closed by its respective contact on the controller. The system is under the control of the clerk in the Council Chamber. When a division is about to take place, the switch, placed conveniently to hand, is turned so as to start the controller and complete the circuits to the bells. The latter are kept ringing for two minutes, after which it is assumed that all members are present, and the division takes place.

The annunciators were supplied by the Exchange Telegraph Co., Ltd., and are operated, as are also the division bells, by means of a 50-Ah, 60-cell battery of accumulators supplied by the Chloride Electrical Storage Co., Ltd. The 12 printers—there will eventually be 14—which announce the subject being discussed in the Council Chamber, are arranged in two circuits, six in each, and the electrical portion of the mechanism is most ingenious.

Lightning Protection.—With regard to the protection of the building against lightning, the L.C.C. was advised by the National Physical Laboratory. This involved a study of the available literature on the subject, especially in connection with the experience obtained as to the effect of lightning on buildings of a similar design from an electrical point of view. One of the most important factors is that modern steel-frame buildings provide a practically perfect "earth" connection from the roof supports down to the ground. The metal work is, however, inside the shell of the building, and the N.P.L. report was largely concerned with the electrical properties of structures of this type. Assistance was also available from the knowledge obtained from the properties of electricity as used in radio transmission; the report to the L.C.C. dealt with these matters in some detail, and suggested the general lines on which it appeared desirable that protection should be provided. Lightning-conductor points are erected on all the chimneys, the copper strip being bonded to the steel structure of the building, which contains some 10,000 tons of steel. This work was carried out by Messrs. W. J. Furse and Co., Ltd., and it is believed to be the first example of this method of protection against lighting being adopted on a large scale.

Finally, a word of praise is due to Mr. C. W. Humphreys, chief engineer, and to Mr. Chas. A. Baker, M.I.E.E., assistant engineer (electrical) and chief electrical inspector to the L.C.C., for the very able manner in which they tackled a very exacting task.

WHY?

By S. LEES.

The immutability of things mundane abounds in perplexing inconsistencies, inherent naturally and artificial. Engineering practice seems to be singularly prone to this defection. The inconsistencies of the office with the works, and the works with the finished job on site are proverbial, and 'twas ever thus.

In no other branch of electrical engineering, perhaps, is there more marked inconsistency than in the lack of proper understanding shown by maker and designer to a thorough appreciation of all that is necessary in the manipulation of electrical apparatus operating under average work-a-day conditions obtaining in industrial service.

For instance, the importance of preserving a uniform clearance around the air-gap of a commercial a.c. induction motor cannot be overstated, and makers concern themselves in no mean manner in this direction by issuing informative literature wherein attention is directed to the dire effects resulting to the machine if the air-gap be allowed to thin down to vanishing dimensions. Advisory hints are given on the use periodically of the conventional feeler-gauge as a means of avoiding trouble. All of which is, no doubt, very commendable wisdom. But to satisfactorily gauge the air-gap of any electromotor one must needs first get proper introduction for a suitable "feeler" before reaching the "gap." On modern machines the performance of this operation should be readily and easily achieved without undergoing the necessity of removing unwieldy, heavy, and awkwardly-placed doors, covers, grids, end-shields, brackets, and the like, oft-times *mis*-named inspection covers, and fitted with weird fastenings that would puzzle a Houdini in their doing and undoing. Why should a certain machine, which shall be nameless, described as of the "protected type," be possessed of egregious sectional cast-iron end cover overhanging the air-gap by many inches (and thereby preventing access for checking clearances), and barely clearing the rotor end turns of the winding? To reach the gap without removing the said end-covers one would require to put a feeler gauge through an impossible series of gymnastics; it is a physical impossibility even to "visualise" the air-gaps, as is often resorted to as an alternative expedient in an awkward case. For a rated "protected" machine, the design would not have been materially affected by the provision of suitably-placed inspection or feeler apertures in the end-covers.

It would often prove helpful, especially to surveyors, if machines of the enclosed type carried some indication as to the dimensions of the original air-gap clearances. Such figures could easily be stamped on the name-plate, and would often obviate the absurd discrepancies which frequently appear between the maker's certificates and an outside inspector's reports, and which often prove productive of prolonged contentious correspondence. The maker is rarely far wrong, but, of course, his shop facilities for checking, &c., are not available for the surveyor on site, and the latter, painstaking and conscientious though he may be, will, as likely as not, have his findings upset by many mils of superfluous varnish or a *chevaux-de-frise* of burred metal around stator or rotor core. Nor can the "lift" always be tried, nor is it appreciable to the touch, hence that blessed adjective "apparent," prefixed or suffixed as required. Many engine-builders state their cylinder clearances by typing, usually on flanges; so why not electromotor makers?

So-called removable ventilating grids fitted with wire netting of absurd mesh and fixed from the *inside* of end covers are irritating to a degree, especially in cases of urgency, and in the very nature of things "trouble" and breakdown jobs are always importunate. And we

must not forget that the manager—non-technical though he may be, perhaps—needs a lot of persuading that the hour or so taken up in preliminary scouting before actually getting at the cause of the trouble was unavoidable. He sees first and foremost lost production, and, secondly, fails to appreciate, and probably rightly so, why it should be necessary to enter through the back door to unfasten the front gate, so to speak. Perhaps the less said the better about an inspection door whose catch fastening fouls the brush-gear; and that solid cast-iron end covers (detachable) of some 30 lb. avoirdupois held by plain projecting lugs are somewhat unnecessary on a fairly modern 10 h.p. d.c. machine, will hardly be denied.

Urgent jobs seem, cussed-like, to be always of the 99 per cent. order; the remaining 1 per cent. might be conceded the proportion of motor bearings that will permit of proper gauging by feeler in position; it is indeed none too easy to make an optical survey of the internal economy of the average bearing, and it becomes an almost physical impossibility to probe one's digits through the cap-hole. Some sort of periscope might prove a real boon for exploring the ramifications of bearing oil-wells. Those shabby contraptions variously described as bearing-caps, covers, lids, &c., are often simply receptacles for dirt and dust, or open the wrong way, if hinged; if loose, they are ill-fitting and require inordinate digital dexterity to remove, or else are of the fiendish 56-lb. spring-snap kind that trap one's hands, leaving blisters to carry on with for a week.

The saving effected in cost by dispensing with silly apologies for oil-gauges (so called), on perhaps any but three-figure powered machines, might be usefully expended in improving many of the motor terminal features found on a.c. and d.c. machines alike. It is pretty safe to say, even at this day, that a really satisfactory service terminal device, safe and easy of access, facilitating coupling and uncoupling without the use of special tools, having dependable insulation that will withstand "roughing," and of 100 per cent. conductivity is still—as the advertising quack proclaims—"a long-felt want!" Speaking of terminals, in perhaps no other detail of the modern motor is there such a lack of sound design shown as in the numerous impractical forms of terminal arrangements so common curiously on machines of otherwise unimpeachable character. With the exceptions of very few makes, internal terminals and similar connections are quite inaccessible without at least partially dismantling the machines. Surely this should not be so. Further, if makers universally observed the practice of legibly marking in simple characters all terminal connections, so that a wrong coupling would be all but a human impossibility, such an innovation would be welcomed alike by all. And again, the conventional terminal "lug," almost invariably of the eyelet kind, has many inherent defects, and so might be much improved. Siemens and others contemporary over a quarter of a century back, used terminals on their machines which were models of sound design, and the cone socket seldom, if ever, failed.

We suppose in these enlightened days that there is some real and unavoidable engineering necessity for the decided dimensioned discrepancy between the front and back-end shaft journals, so common a feature of current design—say, of machines of over 50 h.p. But what logical reason, economic or otherwise, can be urged for different diameters of shafts in 10 h.p. and 12 h.p. respectively, motors of exactly similar type throughout, catalogued as standard? One realises the absurdity of such vagarious design in the bewildering stock of "spares" carried in cases where scores of machines increasing by almost fractional increments of horsepower are installed. The following list shows the different types of bearing bush fitted to a "standard" enclosed ventilated 20-h.p. motor by six different makers:

No. 1. Phosphor-bronze (or brass) bush. One oiling-ring.

No. 2. Phosphor-bronze (or brass) bush. Two oiling-rings.

No. 3. Phosphor-bronze, white metal lined. One oiling-ring.

No. 4. Phosphor-bronze, white metal lined. Two oiling-rings.

No. 5. Cast-iron, white metal lined. One oiling-ring.

No. 6. Cast-iron, white metal lined. Two oiling-rings.

Such unnecessary want of uniformity seems incomprehensible.

One almost feels constrained to ask whether or no a real necessity exists for the so-called oil-thrower (of the conventional ring form) which is almost invariably fitted to electro-motors. This kind of fitment does not seem to be in much demand on other machinery running at high speeds, too, and the prevention of oil escaping from bearings should not be looked upon as such a difficult problem. The vicious V-rings cut in the shaft of a modern motor cannot be too strongly condemned; likewise those shafts of uniform diameter from the end of the core sleeve or spider, as may be, to the bearing journal. And the average run of oiling-rings strikes one as being a very crude affair, either too heavy or too light. Few are just right; many have a wicked tendency to whirl out of their proper groove, and, hanging impotently on the bush, provide the opportunity which is seized. A simple attachment would effectually prevent such an eventuality, and also serve to guard against damaging oiling-rings when removing or reassembling bearings or shafts. Why does not someone raise a voice against that class of so-called standard motor whose extended shaft does not carry a standard stock-size pulley without thereby blocking out the driving-end bearing oil-hole? And surely it should be practicable to remove motor end brackets or covers without having to withdraw the armature or rotor, as may be, at the same time. A goodly printer's column could be devoted to the shortcomings of machine shaft design, but as this subject might, perhaps, prove too controversial, the writer will content himself by making a not unreasonable suggestion to *all* makers that it would not materially increase its cost if every machine shaft turned out were given a legible identification number (showing its relation to the frame also) stamped preferably on both ends of the shaft.

It seems a shame to have to strip a thoroughly sound winding just to fit a new shaft, but this is no figment of the imagination, as quite a large number of motors are so designed that there is no alternative, owing to the impracticability of withdrawing the old and fitting a new shaft without damaging more or less seriously the winding or core structure. Most motors are fitted with a dust cap or cover over the free end bearing, these being almost invariably fixed by tiny B.A. threaded screws. Might we plead for a bigger screw without the same propensity for hiding itself as its smaller relative; anyhow, anything above 1/16-in. Whitworth is easily found in most works. Some makers recess the bearing nose and press-fit a sheet-metal plate, which is extremely difficult to remove without damaging plate or bearing. Obviously, no great amount of ingenuity would be required to devise a dust-proof and easily detachable screwless cap or plate for this purpose.

The subject of brush-holders and brushes would probably prove more controversial than that of shaft and bearing design. Great things were expected with the birth of B.E.A.M.A., but standardisation is not yet, but then, of course, neither is the Millennium! Still, one might—not unreasonably either—expect by now something more tangible and real in the way of, shall we say, interchangeability at least of the wearing details which require periodically renewing. It might not be out of place to remark on that odious type of brush-holder fitted with a bonding cord which terminates in a plug-pin, the said pin having a nasty knack of protruding inwardly and damaging the commutator by grooving the surface. And then there is the bonding

strip which should provide the straight path between its holder and the spindle, but unfortunately fails in its function, giving rise to those mysterious (?) burnings out of the moving parts of the brush-gear. One forbears saying the rude things applicable to those awful contraptions which still carry on (anyway, the owner does), even when the brush is worn out. That there exists a real need for a pattern of brush-rocker that cannot be moved beyond allowable limits, according to type of machine, will be denied by few. Let us whisper that the best Continentals guard against the frail human element in providing for such a lapse.

One may, possibly, be excused for feeling strongly on the question of protective covers or grids as used on a.c. slip-ring gear. Some curiously divergent designs are to be seen on quite modern machines; for instance, one well-known maker employs a pressed light sheet steel case in stability not unlike a bully-beef can, whilst another uses a massive cast-iron box nearly half a hundredweight avoirdupois, which is held up by means of a couple of ridiculously small wing bolts of the domestic fuse-box variety. Picture the first-named, being a metal canister about 10 in. long by 9 in. in diameter, secured to a flanged extension piece on the machine bearing housing by means of three 3/16-in. bolts, 10½ in. in length, the said bolts being inserted through corresponding holes provided in the outer or dished end of the cover. (Really it makes quite a nice game finding the hole, or the joy at holding up a cast-iron case of some 56-lb. weight, and at the same time wrestling with a couple of insignificant and refractory wing-nuts should fill one with delight.) And lest we forget, it should be remembered that both of these fitments appear on certain modern machines; and, in addition, the covers being totally enclosed, obviously it is necessary to remove them for inspection of the interior. A type of cover (*sic*) which has as its chief merit (?) that of cheapness, is the familiar strip of sheet metal which is banded around the commutator bracket or slip-ring case, as may be, and secured in place by one or more wing-bolts. It is quite common to see such covers made up in one piece 10 ft. long and over, and up to a foot wide. Such covers are extremely awkward things to handle safely, and the work of putting on or taking off may, in certain circumstances, be attended by considerable danger—say by an operative when standing on a ladder, or in the close vicinity of live apparatus, open gearing, &c., not to mention the risk of making a foul on the machine itself.

The question of standardisation of design of motor bases, and particularly as regards the dimensions of the feet, is long overdue. Speaking of bases recalls painful recollections of damaged fingers caused through stubborn holding-down bolts to slide-rails objecting to peaceful persuasion in removal. Perhaps in the fulness of time a slide-rail or base-plate capable of being readily and easily attached and detached without the risk of losing bolts or nuts temporarily, unless suspended in the time-honoured fashion by means of a piece of string, will not be beyond the resources of the modern progressive shop. The shipping about of machines in situations where a crane or even simple "blocks" is not available, is nearly always a slow and laborious process. A method of facilitating the transport of machines, up to fairly big sizes running well into three-figured power, where no lifting is required, is to mount the motor, say, on rollers or wheels, one to each foot of the machine. These can be made massive and after the style of the conventional furniture castor, and, if adjustable, would carry any size of machine. If some ingenious maker would incorporate a simple, inexpensive device in his machines which would obviate the use of those back-breaking pieces of piping, or even the more up-to-date trolley or bogey, he would no doubt reap a rich harvest.

The fitting of bolts and nuts in more or less inaccessible positions and requiring the employment of special angular spanners, out-size box-keys, and the like, is inexcusable in these days, and the use of large-size bolts (quite common up to ¾ in. diameter), having slotted heads, should, and quite rightly too, be tabooed. There are surely plenty of equally suitable and certainly more efficient patterns available for almost any conceivable application. Such large-sized bolts are somewhat of a nuisance and commonly get badly damaged or defaced by rough handling—often unavoidable—in a manner never intended by the designer.

On machines described as being of the self-ventilating type, many of the fans or propellers fitted call for severe criticism. Much might be excused on the score of ignorance of wind mathematics by those responsible for their design, but nothing for the crude fitments so often used as a "fan." Fancy a modern machine fitted with a multi-blade fan runner having its pressed sheet-metal hub held to the machine shaft simply by a series of punch pops projected from the said hub on to the shaft—this is not fiction, but hard fact.

The writer fancies that even cable makers (tough folks though they may be) must sometimes feel grieved to see their beloved stuff mutilated by being savagely drawn through tortuous tracks in ungetatable places, such as behind rotor slip-ring cases and housings, under stator frames and commutator pits, often requiring the aid of blocks and tackle, if not for their insertion, at any rate for their withdrawal, or to unite cable to binding post.

Nor is it an uncommon thing to find slip-ring gear provided with short-circuiting and brush-lifting attachments which are unmarked as regards "on" and "off" positions, and which, in addition, only *pretend* to raise the brushes. As to the machines which have "earthed" rotors, of course nobody ever will want to know if or where so arranged, so the good makers thereof don't worry about giving this information. Apropos of which, no doubt some engineer-surveyors could tell interesting stories.

Loosely attached metal plates indicating conventional diagram connections placed in close proximity to bare metal terminals obviously are objectionable, as are also blue paper prints similarly fixed by mucilage; as is fairly well known, the latter forms a quite good conductor, especially if moist, and most printing paper is hygroscopic.

Any mention of machine name-plates should be outside the scope of these notes, but even those simple but useful adornments fall short of the standard of Cæsar's wife. For instance, machines are commonly found bearing a name-plate, but no serial number thereon, and armatures and rotors abound which carry no identification marks whatever. There seems to be a shyness, too, in some quarters about stating the h.p. or kW, and it would appear as if the space religiously allotted to the amperes were sacred, if the virginity of the plate be any criterion; rotor volts are practically unknown, except, perhaps, to the Continentals. Particulars of weight, of course, nobody expects to find on a name-plate; such information is available in the shipping columns of makers' lists—sometimes. Some name-plates are attached to machine frames in a very paltry manner. The writer has come across examples held on by tiny wood screws, and even brass tacks driven into wood plugs. A word might be said regarding the reprehensible practice one occasionally finds of the original maker's name-plate being changed or altered, usually during installation or when passing through dealer's hands. This is apt to lead to confusion, and any craving for advertisement by an interested party would surely be fully met by attaching an additional plate.

A certain type of power plant, the product of a British maker who shall be nameless, is turned out bearing its maker's name and class, but no further particulars as to voltage, capacity, or even a serial number. The absence of such, almost in a sense vital, information is often the cause of much confusion and dispute in cases of survey for valuation and insurance, and the annoyance and vexation arising through the lack of the necessary means of proper identification of individual machines may present a more serious aspect than that Gilbertian quandary—"which was which he could never make out."

E

A SIMPLE AND INEXPENSIVE METHOD OF TESTING INDUCTION MOTORS.

By F. A. COOK, B.Sc.

There are probably many engineers in charge of plant using alternating current as a means of power supply who supervise the repair and rewinding of their own machines as occasion demands.

In a large number of manufacturing works the motors are comparatively small, say up to 60 or 100 h.p., and of a similar type.

After rewinding, the question of putting the motor on to full or even overload for a period arises, as many motors have to be placed in positions where handling is difficult, and when once on site it is desirable to know that no trouble will arise.

It is therefore the object of this short article to describe a method adopted by the writer, which, although it does not involve any new principle, does not appear to be thoroughly appreciated by all concerned.

The advantage of this method of loading a machine is that it does not involve the expenditure of much energy, only the losses of two machines have to be supplied—a consideration when dealing with large machines—and does not require a special brake or dynamo to which the motor can be belted and the electrical energy obtained dissipated in resistance.

Two similar machines are desirable for the test, not necessarily, however, rated at the same speed. The procedure is to fit different size pulleys on to the two motors, to belt these together, with the result that one

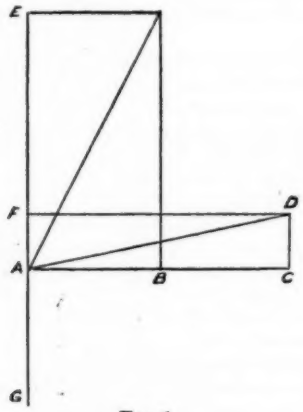


Fig. 1.

will run above the synchronous speed of its rotating field—this machine will then become a generator. A couple of stout battens and slide rails on to which the motors can be bolted are all that are necessary in the way of foundations.

By varying the amount by which one machine runs above synchronous speed in the case of squirrel-cage motors, and in the case of wound-rotor machines by adjustment of the rotor resistance in addition, the amount of load on the machine which is motoring can be varied.

For example, a 4-pole induction motor on a 50-cycle circuit will have a synchronous speed of 1,500 r.p.m., and, when loaded, will run with about 5 per cent. slip, *i.e.*, to 1,575 r.p.m., and, allowing for 3 per cent. slip of driven motor up to 5 per cent. above synchronous speed, *i.e.*, at 1,575 r.p.m., and, allowing for 3 per cent. slip of belt, this will require a pulley ratio of 1,425/(1,575+ 3 per cent.×1,575)=.875 to 1. That is, a 10-in. dia. pulley on the motor will require an 8¾-in. dia. pulley on the generator. Slight differences can be made up by variation of the belt tension.

The current input from the line to two machines coupled in such a manner will be fairly large, but will be at a very low p.f., as it has to supply the magnetising current and current for I^2R, iron and friction losses.

In the sketch (fig. 1) AB is the magnetising component of current to motor; BC is the magnetising component of current to generator; AE is the power component of current to motor; AG is the power component of current from generator; AF is the losses of both machines (difference of AE and AG); and AD is the current from the line at a low p.f.

This test does not aim at obtaining the efficiency of any motor, although this could be done by employing suitable wattmeters.

It will be agreed that to run an induction motor light does not give an indication of what will occur on load, since, supposing the rotor resistance is high owing to running of solder through overload, the no-load speed will be in order, but on load the speed will drop unduly, whereas by loading one machine to its full-load amperage by the above method, running it for, say, six hours and taking the speed, one is able to say definitely what the performance of the motor will be when fixed in position.

WATER-POWER FOR THE FARM.

By W. FRANCIS LLOYD.

Farmers and estate owners in this country are not fully aware of the advantages that may be derived from the modern small water turbine, the development of which has now reached a high state of efficiency.

What the average farmer does not realise is the amount of power which can be obtained from a fairly small stream at a low cost. The power obtained from the old-fashioned water-wheel often misleads the farmer in this respect. The power output of a modern water turbine —a very small machine compared with a water-wheel— is roughly twice that of the latter, owing to the fact that the water-wheel has a low mechanical and hydraulic efficiency, while the modern water turbine develops more than 80 per cent. of the theoretical power.

For the purpose of illustration we will consider a stream having a flow of 6 cubic feet per second and falling gradually from one place to another having a difference in level of, say, 15 feet. Provided this difference in level occurs in a reasonably short distance, an embankment, wall, or open wooden flume could be put up in order to concentrate the drop in level at one point, as is done in the case of water wheels. A water turbine to drive a dynamo could then be installed at this point to give an output of 8 brake horse-power.

It should be remembered that 8 horse-power is sufficient to light continuously 100 40-candle-power ordinary incandescent lamps, or twice that number of "half-watt" type lamps.

The farmer probably does not need to be told what use he could make of 8 horse-power during the day-time.

The Dry Months.—What happens in the summer-time when the flow of water is diminished?

In large hydro-electric schemes ample provision is made for this contingency by transforming small valleys into storage reservoirs which conserve the surplus water of the wet season so as to provide the requisite quantity of flow in the dry season. Medium-sized water-power schemes, which do not possess the advantage of natural features to provide such storage, have recourse to stand-by sets of oil or steam power to supplement the decreased output of the water turbines during the two or three dry months.

In very small developments, such as the one we have considered above, the plant is usually designed for the minimum flow of the dry season, the surplus water of the wet season being allowed to run to waste. A larger continuous output could be economically obtained by designing the plant for the average quantity of flow, and—where storage is impossible—utilising a stand-by set for the dry months. However, when the load consists chiefly of lighting demands, it is nearly always possible to arrange for a day-to-night storage of water by providing a small pond of sufficient capacity for

storing water from the stream during the day, to provide the normal output at night. In this case no standby set will be necessary. As regards power, the demand is at its lowest during the dry months, and some operations can be wholly postponed until ample power is available.

Cost of Plant.—Now comes the all-important question of cost. The cost of the 8-horse-power turbine, dynamo, switchboard, &c., for the above development would be in the neighbourhood of £200, which is not more than what a petrol or oil-engine lighting set of the same output would cost. But, of course, in the case of the water-power set, there is the additional expense of constructing the water intake, which would vary considerably with the nature of the local conditions. Against this, however, must be offset the extremely low operating cost and greater reliability of the water-power plant. Apart from the attention required for turning the turbine on or off, the only running expense is the replenishment of grease cups—an exceedingly small item. The writer knows of cases of water turbines which have run day and night for 20 years with very few stops. The annual bill for fuel, repairs, renewals, &c., for an oil or petrol set presents a very different story. In making a comparison it is only fair to take into consideration the annual operating expenses.

Since the war, considerable impetus has been given to the study of the possibilities of water power in this country, owing chiefly to the high cost of coal and other fuels. Despite the commendable prominence given to the subject by the Press, owners of estates have been slow to realise the opportunities lying at their very doors. In the meantime these water powers are running to waste.

THE ELECTRICAL EXHIBITION OF 1924.

We have now received from the Director of the B.E.A.M,A. a little more information regarding the arrangements, so far as they have been made, for the Electrical and Allied Engineering Section of the British Empire Exhibition, which takes place at Wembley Park in 1924.

We stated some weeks ago, on the authority of an announcement which appeared on the back cover of *Beama* that the Section would be organised and space allocated by the B.E.A.M.A. under the direction of a special committee representing all branches of the electrical industry; it was announced that space would be reserved according to priority of application. In our issue of June 30th, in a leading article entitled "Looking Ahead," we dealt with the importance of the exhibition and with the World Power Conference which is to be held while the exhibition is in progress. It is unnecessary, therefore, for us to discuss these matters further now.

We are officially informed that an arrangement has been entered into between the British Empire Exhibition authorities and the B.E.A.M.A., under which "practically the whole organisation of the electrical and allied engineering section" is placed in the hands of the Association, which takes responsibility for letting the space allocated to the Section. We are also advised that the work of organisation is well in hand. The word "practically" seems to suggest the existence of some sort of limitation which will probably disclose itself as matters proceed.

The earlier statement that space would be reserved according to priority of application seems to be varied, according to present information, for while it is to be noted that all British manufacturers of electrical machinery and appliances are eligible to exhibit in the Section, whether members of the Association or not, and while inquiries have already been received from outside firms, B.E.A.M.A. members have the right of the first call on the space. They, too, are also entitled to a share of any rebate resulting from the success of the undertaking, to which outside firms will doubtless be contributors.

This, it will be recognised, is somewhat different from the arrangement in force at some previous electrical exhibitions originated by our electrical manufacturers when all exhibitors were entitled to a rebate off the rent paid for space, with the chance of receiving an additional amount back out of any surplus profits earned.

A form of application for space has been issued, and we understand that applications are being received in gratifying numbers, and that space is being allotted. Contracts are made between individual exhibitors and the Exhibition Company, but application must be made through the B.E.A.M.A.

Arrangements are being made with the Exhibition Company, in conjunction with the consulting engineers, Messrs. Sparks & Partners, for the complete equipment of an electrical power station, which it is proposed to erect in the section. Naturally, this power station will itself form an important exhibit, but presumably it is too early to state whose plant will be installed or whose apparatus will be used in the equipment of the restaurant kitchen.

It is understood that the Inland Revenue authorities, in dealing with trading accounts submitted to them by exhibitors, will treat the cost, as and when incurred, of participation in the Exhibition, on the same lines as the cost of advertising generally, and in normal cases will take no exception to such expenditure being admitted as a deduction.

A descriptive pamphlet, entitled "Electrical and Allied Engineering at the British Empire Exhibition, 1924," has now been issued. It gives the names of the B.E.A.M.A. Council, which is "virtually" the controlling body, and of the co-operating committee, which represents various other electrical and allied interests. A meeting of this committee will be convened after the holidays.

We give below the names of the officials and of the Executive and Co-operating Committees:—

General Manager of the British Empire Exhibition.—U. F. Wintour, C.B., C.M.G.

Assistant General Manager.—Major E. A. Belcher.

Consulting Civil Engineer.—E. O. Williams, B.Sc., A.M.I.C.E.

Consulting Electrical Engineers.—Chas. P. Sparks and Partners.

Executive Committee.—Messrs. B. Longbottom (chairman); S. Z. de Ferranti; R. K. Morcom; M. J. Railing; John Taylor; D. N. Dunlop (director); C. Rodgers (secretary).

Co-operating Committee.—Ll. B. Atkinson (The Cable Makers' Association); J. W. Beauchamp (The British Electrical Development Association); A. G. Beaver (The Electrical Wholesalers' Federation, Ltd.); H. H. Berry; D. A. Bremner (The British Engineers' Association); A. C. Cramb (Incorporated Municipal Electrical Association); Dr. W. H. Eccles; J. E. Edgecombe (Electric Lamp Manufacturers' Association of Great Britain); E. T. Ruthven Murray (The Incorporated Association of Electric Power Companies); Colonel Sir A. M. Ogilvie, K.B.E., C.B., V.D., R.E., (Institution of Electrical Engineers); H. Clifford Palmer; W. Riggs (The Electrical Contractors' Association); C. H. Wordingham, C.B.E.

The imperial significance of the exhibition is emphasised in the early part of the pamphlet. A general plan is included, showing the proposed lay-out of the whole exhibition grounds. The electrical and allied engineering section will be situated in the northern half of the Machinery Hall, and this section is repeated on a lay-out in detail and the charges for space.

A Hint to Britain.—The London (Ontario) City Council will shortly take up the matter of a proper regulation and licensing of 'buses. It is claimed by some of the aldermen that it is unfair to make the street railway pay its share of the cost of paving on streets where its lines run and then permit 'buses to run with only the payment of an insignificant licence fee.—*Electrical News.*

PARLIAMENTARY NOTES.

[By Our Special Parliamentary Reporter.]

Empire Wireless Chain.—On August 1st Mr. Hurd asked the Postmaster-General whether he had considered the suggestion that an Imperial Wireless Council should be appointed, to include representatives of the Dominions and India, so as to establish the fullest possible co-operation in the development of wireless facilities within the Empire; and whether he could make an announcement on the subject.

Mr. Kellaway said that questions of policy relating to Imperial wireless communication were at present referred to and, subject to the Cabinet, decided by the Imperial Communications Committee, of which the Secretary of State for the Colonies was Chairman, and on which the India Office was represented. Whether it would be desirable to include direct representation of those Dominions controlling Imperial wireless stations would be considered when the Dominions had decided upon their policy.

Sir Harry Brittain asked the Postmaster-General what support he was receiving from the different parts of the Empire in furtherance of the wireless chain; and what was approximately the earliest period within which this form of inter-Empire communication might be completed.

Mr. Kellaway said that the revised scheme of Imperial wireless communication had been communicated to the Indian and Dominion Governments and, until replies were received, he was unable to answer the question.

Mr. Hurd asked whether the representatives of the Canadian Government had yet reached this country for the discussion of Canada's relation to the Imperial Wireless Chain; and, if not, when they would arrive.

Mr. Kellaway said that the answer to the first part of the question was in the negative. The Canadian Government had appointed its representatives, but so far as he was aware, had not fixed a date for their departure.

Broadcasting.—Mr. Percy asked the Postmaster-General if negotiations for the institution of wireless broadcasting had yet reached a satisfactory conclusion, and if he could make a statement on the matter; and whether he would arrange for a demonstration of wireless in some convenient room in the House for the information of members.

Mr. Malone asked for particulars of the broadcasting services company or companies which were to be formed.

Mr. Kellaway said that he regretted he could not arrange for a demonstration before the adjournment of the House, but, subject to the consent of the authorities, he would endeavour to do so in the autumn. The formation of the company or companies referred to was still the subject of negotiation between the wireless manufacturers, and he was not able to make any further statement as to its constitution. The Articles of Association would be subject to his approval. The security against a monopoly would lie in the fact that any *bonâ-fide* manufacturer in this country would be eligible for membership, and apparatus manufactured by him would be admissible for use under the licence.

Mr. Kellaway made a further statement on wireless broadcasting on August 4th. He said that it was a physical impossibility to have a large number of firms broadcasting. Any qualified firm of electrical manufacturers could provide the instruments, but that could not be the case in the provision of the actual broadcasting services. He hoped that, within the next fortnight, the firms concerned would have come to an arrangement regarding the control of the broadcasting service. The profits of the company were to be limited to 7½ per cent. For the control of prices of receiving instruments, he relied on the ease with which manufacturers could obtain licences. He regarded it as essential that this new form of communication, in all its aspects, should be under British control.

The Scarborough Order.—On August 4th Mr. Manville asked the Parliamentary Secretary to the Ministry of Transport whether he could give any reason for the undue delay in connection with the confirmation of the Scarborough Electricity (Amendment) Special Order, 1922, the order having been forwarded to the Electricity Commissioners in an agreed form on May 30th last.

Mr. Neal said that he could not agree that there had been any delay. The Order was received from the Electricity Commissioners for confirmation on July 8th, and the statutory notice of intention to confirm the Order was sent to the promoters' solicitor on July 11th. The period required by statute for lodging objections was not less than 21 days. The latest date fixed by the Minister for posting objections in the present case was August 5th.

Royal Assent.—On August 4th, the Royal Assent by Commission was given to the following Bills:—Electricity (Supply) Bill; Ayr Burgh (Electricity) Bill; Grampian Electricity Supply Bill; North Metropolitan Electric Power Supply Bill; Telegraph (Money) Bill; Post Office (Pneumatic Tubes Acquisition) Bill; Bristol Tramways Bill; London County Council (Tramways and Improvements) Bill; and the Black Country Tramways and Light Railways Bill.

The Adjournment.—Parliament rose for the summer adjournment on Friday, August 4th, and will reassemble on Tuesday, November 14th.

CORRESPONDENCE.

Letters received by us after 5 p.m. on Tuesday cannot appear until the following week. Correspondents should forward their communications at the earliest possible moment. No letter can be published unless we have the writer's name and address in our possession.

Wireless Valve Sets.

Mr. V. Delebecque has touched on points of great concern to prospective wireless apparatus purchasers and manufacturers.

Apart from crystal sets, which are toys unless you live next door to a broadcasting station, two large concerns hold master patents on essential inductive coupling methods generally used with valve sets. True, permission is given to amateurs to make experiments infringing these patents, but they may not buy such complete, or incomplete, sets ready made, neither can the manufacturer obtain a licence to build such sets on royalty. The deadlock deters good-class firms from entering the field, and minor ones already in resort to subterfuge and the sale of ex-Government apparatus, royalty free.

Although the broadcasting scheme seems slow there is enough doing in the ether to interest the skilful amateur, but the manufacturer is on uncertain ground, technically and financially, and concerning component parts, production already exceeds the demand.

The daily Press, in booming wireless telephony prematurely, for the sake of advertisement, has done a lot of harm, and would have been better directed to a demand for freedom of design for broadcast receiving sets of British manufacture on a reasonable royalty basis.

H. Leslie Dixon.

London, E.1, *August 2nd*, 1922.

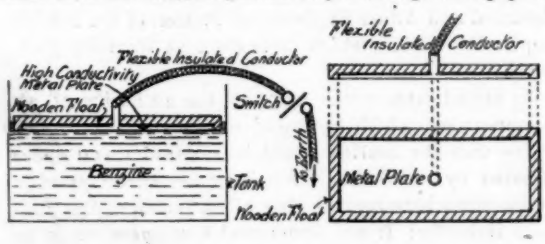
Removal of Static Charge.

In reply to your correspondent, "F.W.F.," in your issue of August 4th, I think the entire removal of the static charge from the surface of the benzine would be extremely difficult.

I would, however, suggest as an experiment, that the apparatus shown in the accompanying diagram be given a trial, and I venture to think this should meet with some measure of success.

The apparatus consists of a light wooden float, made to cover the surface of the benzine. Attached to the bottom of the float is a plate of high conductivity metal (preferably aluminium) riveted to which is a metal rod which passes through the centre of the float to an insulated flexible conductor, connected through a switch to earth.

This switch should be kept open during the immersion or removal of the float to prevent any discharge taking place



between the surface of the benzine and the metal plate, and should be closed during the rinsing process.

It is also advisable to have the metal plate recessed into the wooden float, to prevent a discharge between the metal plate and the sides of the tank taking place.

The apparatus would be inexpensive, and simple to make, and I would like to hear the result of a test by this method.

Horace J. Arthur.

Wolverhampton, *August 5th*, 1922.

I should be interested to know whether "F.W.F." has tried enclosing his fabrics in a bare wire basket, or "Lobster Pot," effectively earthed by means of a flexible earth wire, prior to immersion.

Walter E. Rogers, A.M.I.E.E.

Shepherd's Bush, W.12,
August 7th, 1922.

Belgian Electrical Signalling Apparatus.

We notice that on page 125 of your issue dated July 28th, 1922, under the above heading there appears a small paragraph relating to the special works which our company has established at Ruysbroeck, near Brussels, for the manufacture of railway electrical signalling apparatus, which conveys the impression that we have only recently undertaken the manufacture of this material. The actual fact is that we have been manufacturing this apparatus in Charleroi since the year 1910, but owing to the very large developments which have since taken place, and the volume of orders placed with us, we found it necessary to establish the special works in

question, and at the present time have orders in hand for the Belgian State Railways, and for other customers, which will keep us fully occupied for at least 18 months.

As the paragraph in question conveys an erroneous impression, we shall much appreciate your giving publicity to this explanation.

Ateliers de Constructions Electriques de Charleroi.
John H. Bunting,
London, S.W.1. *British Manager.*
August 3rd, 1922.

Small Private Generating Stations.

The attention of the Electricity Commissioners has been drawn to a paragraph entitled "Small Generating Stations" on page 723 of the Electrical Review of May 26th, and to an article entitled "The Village Power Station" on page 43 of the Electrical Review of July 14th.

The latter article commences with the sentence: "Following the notification that small *public* generating stations below 50 kW capacity may be started without permission being obtained from the Electricity Commissioners. . . ."

This statement is not in accordance with the facts, as the notification dated May 12th, which was issued by the Commissioners to the electrical Press and others, referred definitely to small *private* generating stations.

The Commissioners feel that you will no doubt wish to issue a correction on the above point.

Electricity Commission,
R. T. G. French,
London, S.W.1, *August 4th*, 1922. *Secretary.*

A Proposed Christian Order of Industry.

In the Electrical Review of August 4th, the writer of the leaderette on "A Proposed 'Christian Order of Industry'" has expressed the "belief that the leavening influence of Christianity is operating in hundreds of unrecognised ways *because it is operating freed from the objectionable restrictions and shibboleths of orthodoxy.*"

May it be permitted, sir, to me—who, for the last 45 years, have looked to the Electrical Review as to a valued friend—to express regret that the leaderette writer, in assigning the reason described in those of his words which I have italicised, has infringed the hitherto—under present circumstances—laudable exclusion of religious controversy from your columns?

What could be more conducive to polemical strife than the way in which your writer has associated "orthodoxy" with alleged "objectionable restrictions and shibboleths"?

The dictionary* meaning of orthodoxy is "soundness of opinion or doctrine; belief in the genuine doctrines of scripture: *orthos*, right, *doxa*, opinion—*dokéo*, to think."

* Chambers's Etymological Dictionary of the English Language.

Incidentally, the foregoing definition, of course, rightly presupposes the existence, amongst us, of a consistently authoritative teacher and expounder of scripture.

Finally, your writer, sir, would appear to think either (1) that your readers have no use for Christian orthodoxy, or (2) that those who—like myself—for good reasons, with heart and soul accept the same, may, with impunity, be slighted.

Edward Raymond-Barker.
London, *August 7th*, 1922.

Upon opening your issue dated 4th inst., I had to rub my eyes and scan the title of your journal, just to make certain that one of my weekly technical papers had not fallen into the hands of the "Society for the Furtherance of Christianity." I note that you were both amused and surprised at the suggestion that the "F.B.I." was behind the latest move; be that as it may, it is absolutely certain that the Church is behind the move.

Christian principles indeed!—What exactly does that cover? The Christian principles which are applied by avowed Christians to-day, with all their narrowness, bigotry, intolerance, and everlasting "Be content brother, you are sure of a harp or some other musical instrument in the next world, so don't mind what happens to you here?" I do not expect you to allow your valuable pages to be taken up by a theological discussion, but I think the statement that Christianity has any leavening influence, is open to very serious doubt, in fact if you examine Christianity, you will find that it has not only not benefited mankind, but has always acted against the mass (usually in the most horrible and cruel ways) for the benefit of the few. There is also another way of looking at your support of the movement. You have readers who may embrace some other religion (there are a few hundred equally authentic others) and again a number "sans" religion. Does it not strike you that you may appear to them just a little one-sided, when you use your pages to boost any particular crowd? I trust you will see your way to publish this, and if I may venture a suggestion, let the Review remain a technical and scientific journal without sect or creed.

Reason.
August 7th, 1922.

[It is obvious that the purpose of our leaderette has been fulfilled. Every movement for assisting toward a solution of industrial troubles is legitimately within the scope of an industrial journal, but we have no intention to allow our pages to be occupied with theological discussions. It will do no harm to any of our readers to secure a copy of the re-statement from the Secretary, who no doubt will welcome an expression of their views, but the peaceful columns of the Electrical Review are not the place in which to let loose the spirits which so often accompany religious controversy. We cannot publish any more letters.—Eds. Elec. Rev.]

BUSINESS NOTES.

Bankruptcy Proceedings.—J. R. Norris (Acme Electrical Co.), electrical engineer, 80, Warley Road, Blackpool.—First meeting, August 11th, at the Official Receiver's offices, Preston; public examination, September 22nd, at the Court House, Blackpool.

H. S. Rogers, electrical engineer's sales manager, 21, Derby Street, Walsall.—First meeting, August 14th, at the Official Receiver's office, Wolverhampton; public examination, August 16th, at the Court House, Walsall.

Company Liquidations.—I.T.E. Electric Co. (1907), Ltd.—Winding up voluntarily. Liquidator: Mr. D. H. Jeboult, 9, Walbrook, E.C. Meeting of creditors, August 16th, at the liquidator's office.

Brotherton Ediswan Tubes & Conduits, Ltd.—Meeting of creditors, August 14th, at the Victoria Hotel, Wolverhampton. Liquidator: Mr. R. H. Johnston.

Electrical Development & Finance Corporation, Ltd.—A meeting of members is called for September 5th at 90, Cannon Street, E.C., to hear an account of the winding-up from the liquidator, Mr. W. B. Stone.

Electrical Maintenance Co. (Liverpool), Ltd.—A meeting of members is called for September 5th at 8, Victoria Street, Liverpool, to hear an account of the winding-up from the liquidator, Mr. J. Airey.

Dissolutions of Partnership.—Kirkby & Livesay, engineers, Lloyd Bank Buildings, King Street, Manchester.—Mr. T. M. Kirkby and Mr. A. G. Livesay have dissolved partnership. Mr. Livesay will attend to debts and continue the business in his own name.

Messrs. Sales & Ash, 11, Chichester Rents, Chancery Lane, W.C.2.—Partnership dissolved. The business is now being carried on by Mr. G. W. Sales, under the style of Sales & Co. All debts will be attended to by Mr. Sales.

The Nottingham Radio Supplies, dealers in electrical wireless apparatus and fittings, 3, The Poultry, Nottingham.—Mr. G. A. Litchfield and Mr. H. Walker have dissolved partnership. Mr. Litchfield will attend to debts and continue the business under the same style.

Trade Announcements.—Messrs. Hewett & Co., of 315-317, High Road, Chiswick, London, W.4, are now wholesale electrical factors.

The new address of the Bastian Electric Co., Ltd., is 58, Haymarket, London, S.W.1.

Catalogues and Lists.—Mr. H. B. Turner, 79, Playford Road, N.4.—An illustrated leaflet, describing the "Unit" time switch for electric signs, window lighting, &c.

Ateliers de Constructions Electriques de Charleroi, 56, Victoria Street, S.W.1.—August stock list of motors and dynamos.

Messrs. James McMillan & Co., Clun House, 17, Surrey Street, W.C.—Catalogues No. 704, giving details of an electric iron, and No. 702, describing an electric soldering iron, both of Norwegian production.

The British Thomson-Houston Co., Ltd., Rugby.—Descriptive List No. 4,221-B, containing numerous illustrations, with details, of automatic circuit-breakers (air-break) of various types. Also Price List No. 5,115-B, giving prices, &c., of a.c. hand-operated starting and regulating rheostats; and Price List No. 4,501-D, dealing with lightning arresters for d.c. circuits.

Enterprise Manufacturing Co., Ltd., Electric House, Grape Street, Shaftesbury Avenue, W.C.2.—Net trade price list of cables, wires, conduits, lampholders, switches, fuseboards, and other electrical accessories.

Messrs. John Musgrave & Sons, Ltd., Bolton.—An illustrated reprint dealing with the Musgrave steam extraction engine.

Price's Electrical Supplies, Ltd., Caxton House, 58, Great Charles Street, Birmingham.—Monthly net trade price list of electrical accessories of all descriptions.

Measurement, Ltd., 34-38, Provost Street, City Road, N.1.—List A-2, giving an illustrated description, &c., of house-service a.c. watt-hour meters.

For Sale.—By direction of the Disposal Board, Mr. C. D. Phillips will sell by auction on August 16th and following days at Swindon, plant and machinery, including electrical plant, cable, &c. (See our advertisement pages to-day.)

Book Notices. — "Electrical Engineers' Pocket-Book," 487 pp. (2nd edition). London: International Correspondence Schools, Ltd. Price 10s. 6d.—Although this is called a second edition it is actually the first edition of an electrical pocket book, the previous work being a mechanical-electrical work. As stated in the preface, the book does not consist merely of a collection of tables and formulæ, but aims at imparting information in a continuous manner. Following this rule, it opens with a hundred pages on mathematics, in which a condensed treatment of the principal elements of calculation is given. After this there appears a short section on physics and chemistry, as related to engineering, and then a large number of pages are devoted to mechanical details, *i.e.*, power transmission, boilers, &c. The electrical section commences at magnets, and passes to induction coils, alternating currents, the construction and operation of electrical machinery, transformers, converters, transmission, secondary batteries, wiring, illumination, &c., finally dealing briefly with electric traction and electro-chemistry. Much has been squeezed into a small compass; the book is a kind of "electrical review," which may be employed in conjunction with more detailed treatises.

"Seventeenth Annual Report of the Rand Water Board" (year ended March 31st, 1922); 63 pp. and 4 diagrams. Johannesburg: Hortons, Ltd.—The report states that during the year two sets of electrical remote-control equipment were installed in connection with the Zwartkopjes bore-holes, one American and one British. While the former was found to be satisfactory the latter was incomplete. Severe electrical storms again affected the working of the pumping plants at Zwartkopjes and Zuurbekom; the former was shut down on fifty occasions for an aggregate of 67 hours, and damage was done to the extent of £29; Zuurbekom was closed down on 27 occasions, aggregating 95 hours, the cost of damage being £50.

The *Journal* of the Junior Institution of Engineers, Vol. XXXII, Part 11, August, 1922. London: Percival Marshall and Co. Price 2s.—This number of the *Journal* contains a portrait and biography of the President (Mr. C. H. Wordingham, C.B.E.); a paper on "The Utilisation of Water Power," by Capt. H. Whitaker, late R.E.; reports of visits to the Pirelli-General cable works and the Kearney high-speed railway; and notes of proceedings.

Journal of the American Institute of Electrical Engineers, Vol. XLI, No. 7, July, 1922. New York: The Institute. Price $1.

"The Henley Telegraph," June, 1922. (32 pp.) Price 8d. post free.—The staff magazine of Messrs. W. T. Henley's Telegraph Works Co., Ltd., still holds its own as the most literary of its kind. Apart from a number of interesting notes and articles, this issue contains an appreciation of Sir George Sutton, Bart., and a list of the firm's recent contracts.

"The Metropolitan-Vickers Gazette," June and July, 1922. Price 1s. per copy.—The first of these two issues contains an article on battery locomotives for industrial shunting yards, notes on development in power-station switchgear, &c. The July number contains a paper read before the American I.E.E. by Mr. A. P. M. Fleming, C.B.E., upon "Some Developments in Insulating Materials and Processes in Great Britain"; "The Jointing of Metals," by Mr. S. J. Nightingale; and "Co-operative Electricity Supply in Switzerland," by Mr. E. M. Johnson.

"Sierra Leone Railway: Administrative Report for the year 1921" (46 pp.). Freetown: Government Printing Office.—This gives full details of passenger and goods traffic; matters affecting *personnel*; accounts of various departments, &c.

The *Journal* of the Institution of Electrical Engineers, Vol. 60, No. 310, June, 1922. London: E. & F. N. Spon, Ltd. Price 10s. 6d.—This contains the 13th Kelvin Lecture on "Electricity and Matter," by Sir Ernest Rutherford, F.R.S.; the following papers:—"Electric Motor Starters," by J. Anderson (with discussion); "Phantom Telephone Circuits and Combined Telegraph and Telephone Circuits, worked at Audio Frequencies," by J. G. Hill; and "The Thermionic Triode as Rectifier," by E. B. Moullin, M.A., and L. B. Turner, M.A.; also discussions on "Starters" and "Single- and Three-phase Commutator Motors." Another feature included is a set of directions for the study of untreated electrical insulating papers.

Annual Outing.—The annual outing of the London staff of the City Electrical Co. (C.E.C., Ltd.) took place on Saturday, July 29th, Brighton being visited in charabancs. At the luncheon the health of the firm and the managing director, Mr. H. E. Ellis, was toasted. Mr. Ellis, in his reply, referred to the continued progress of the business. The organisation arrangements were in the hands of Messrs. E. Youldon and T. H. Windibank, to whom gold-mounted briars were presented.

Telephone Manufacture in Australia.—Replying to a question as to whether telephone parts could not be manufactured at the Lithgow Small Arms Factory, as was proposed some time ago, the Postmaster-General declares that the trouble is that a factory working solely on telephone material could turn out in one year more than would be required by the department for several years. Recently Mr. Poynton communicated with English firms, asking whether they would be prepared to inaugurate the manufacture of telephones in Australia. The replies received indicated that the firms would undertake the works provided they were guaranteed a certain amount over and above cost price, but the Government could not see its way to agree to this.—*Reuter's Trade Service* (Melbourne).

Projected Electrical Exhibition at Brussels.—*Le Soir* reports a recent meeting of leading Belgian engineers and industrialists to discuss the holding of an international electrical exhibition in Brussels in 1925. A commission was formed to make preliminary arrangements. Another meeting is to be held in October, at which proposals will be put forward regarding the organisation of national and industrial groups and sections.

Reduction in Railway Rates.—Considerable prominence has recently been given to the reduction in railway rates, which came into force on August 1st, 1922, some papers having stated in large headlines that this reduction amounts to 25 per cent. on existing rates. This is not the case, the reduction being from 200 per cent. to 175 per cent. of pre-war rates, or 12½ per cent. The reductions in the flat rate bring the total reduction to approximately 15 per cent. Whilst electrical traders are grateful for small mercies they regard this reduction as quite inadequate to induce them to send all their traffic by rail, and it is felt that the reduction in rates is not commensurate with the reduced costs of wages and materials. No reduction whatever was made to the traders last year when the reduction in transport wages, amounting to about £20,000,000 per annum, took place, to say nothing of the reduction in the costs of material. One should not overlook the fact that the railway companies have very largely increased their reserve insurance and depreciation funds during the years 1913 to 1921. The London & North-Western Railway Co., for example, increased its reserve fund by over £10,000,000 during this period, and the aggregate funds of all the railway companies amounted on December 31st, 1921, to £71,500,000. With a view to stimulating trade, manufacturing concerns frequently reduce their prices, even when manufacturing costs do not appear to justify it. Much more should the railway companies adopt a liberal policy in their present circumstances in the interests of the whole trade of the country, upon which, of course, the prosperity of the railways depends. Another point to bear in mind is that the reductions do not apply to through traffic between the English and Scotch railways, as the Scotch companies have made no reductions.

The Russian Electrical Industry.—A report has recently been submitted to the Gosplan (Government Planning Section) on the position of electricity in Russia. The report goes over the extremely unsatisfactory condition of the electrical economy of the country, particularly of the electrical stations, the plant in which is very much worn, so that 50 per cent. is quite unusable, and the remaining 50 per cent. in many cases is coming to its end. It is observed that the electrical equipment factories, though in difficulties, make a somewhat better showing. They were not so hard pressed during the Revolution as the stations, so that the wear is not so great, although about 35 per cent. of the equipment is worn out. The factories are without means of recuperation, and the financial position of the industry, whether in trusts or otherwise, is extremely difficult. The indebtedness of the various factories amounted to no less than 43,134,200 roubles for wages alone by May 1st. The possibility of realising goods and thus raising money is small. The question has arisen of bringing some pressure on the defaulting departments of the Government to pay what they owe to the respective electric concerns to which they are indebted; and further, the Government Planning Section, on behalf of the electrical industry, has recognised the necessity for controlling the issue of permits for importing goods, so that the foreign trading section may be prevented from importing such goods as may be protested against.

A Long-Service Battery.—Another instance of the longevity of "Exide" batteries has been provided by one of the Chloride Electrical Storage Co.'s customers. This battery was fitted on a "Cadillac" car eight years ago, and after running 40,000 miles and providing energy for lighting and starting, is still in service. An automobile agent estimated the battery's effective life at two years.

Local Libraries and Commercial Information.—As the result of co-operation between the local Chamber of Commerce and the public libraries, there is available at the Croydon Reference Library a complete set of town and trade directories, year-books, time-tables, codes and maps, in addition to ordinary books on business; also a vertical file of clippings, articles, pamphlets, &c., on current business and public questions has been compiled and is maintained with the co-operation of a business committee.

The Yorkshire Electric Power Co.—At the celebration of the 21st anniversary of the formation of the company, briefly reported in our last issue, Mr. W. B. Woodhouse, engineer and manager, outlined the company's history. He pointed out that the first year's revenue was only £900, whereas last year it amounted to about £400,000. The company's mains extended from the borders of Derbyshire in the south, to Otley in the north; and from the borders of Lancashire in the west, to Goole in the east. Although progress had been rapid, still further developments were to be looked for in the near future.

Chinese Import Trade.—The rapidity with which China is being industrialised is referred to in the recently issued report for 1921 of the Chinese Maritime Customs, and some striking figures are quoted in illustration of the movement. For example, machinery for the textile industries was imported to the value of 26.7 million taels in 1921, as compared with 6.9 million taels in 1920 (the tael averaged 4s. in value in 1921). The imports of propelling machinery doubled in value during the same period. Of the total value of 26.7 million taels (say £5,300,000) of imported textile machinery, £2,200,000 represented imports from Great Britain, £1,500,000 those from the United States, £850,000 Canadian, and £720,000 Japanese. International competition is obviously keen. With regard to electrical needs the tendency is towards the installation of larger units, *e.g.*, of 1,000, 2,000 and 5,000 kW. The sale of small lighting plants has been adversely affected on this account, and also because of bad trade conditions. Yet imports of electrical materials and fittings amounted in value to £2,600,000 last year, or more than double the figure of the preceding year. The Japanese have held the market for wires and cables, porcelain insulators, &c., the Dutch for lamps, and the Americans for better-class fittings and glassware.

Manufacture of Asbestos Products in Canada.—According to *Reuter's Trade Service* the manufacture of finished asbestos products in Canada (which supplies 80 per cent. of the world's production of the raw material) is shortly to be undertaken by the Johns Manville Co., an American concern, which is already operating plants at Waukegan, Illinois, and Manville, New Jersey. The plant will be established at Asbestos, Quebec, at a cost of approximately $1,000,000.

Price Reductions.—Messrs. Henry Wiggin & Co., Ltd., Birmingham (selling agents: Lionel Robinson & Co.), are making considerable reductions in the prices of their "Ferry" resistance wires and "Glowray," "Redray," and "Brightray" nickel-chromium wires for cooking and heating apparatus.

Australian Government and "Dumping."—A Reuter dispatch from Melbourne reports Mr. Hughes, the Prime Minister, as stating that the Commonwealth Government will shortly introduce an amendment to the Preservation of Industries Act, with a view to dealing more effectively with "dumping."

Annual Sports.—On Saturday, July 29th, the Chloride Electrical Storage Co., Ltd., held its sixth annual flower show and second annual sports at Clifton Junction. The weather was not too propitious, but for all that the exhibition was decidedly successful, and a large proportion of the sport events was successfully completed. An inter-works tug-of-war between the Chloride Co. and Messrs. Pilkington's Tile and Pottery Co. resulted in a win for the Chloride Co. for the second year in succession. The famous Besses-o'-th'-Barn band played to an attendance which numbered at least 1,800. The Chloride Co.'s playing fields, tennis courts, bowling green, gardens, and canteen were looking their best, and came in for much admiration.

Manufacturing in Holland.—The report of the Hengelosche Electrische en Mechanische Apparaten Fabriek (Heemaf), of Hengelo, for 1921, complains loudly of German competition, and states that this rivalry and the small demand rendered it impossible to work on a remunerative basis. Having regard to the uncertain conditions and the expected long continuance of the depression, the directors had considered it desirable to restrict operations and not further increase the stocks of manufactures. At present the export business in the principal products largely exceeds the inland turnover, although great difficulties are experienced through the constant changes in the import duties of the countries to which exports are forwarded. As the company's production of motors only forms a portion of the total number of motors sold monthly in Holland, the chance exists of a considerable improvement in the home trade in this branch on a further increase in German prices. There are grounds for expecting that the amount of the turnover necessary to cover the working expenses will be realised in a measurable period, and the future is therefore looked forward to with more confidence than was the case a year ago. After appropriating the reserve fund of 928,000 florins, a debit balance of 720,000 florins has been carried forward. The report adds that favourable prospects exist of obtaining a share in the contracts in connection with the electrification of the railways both in Holland and

A Belgian Company.—The Société de Constructions Electriques de Belgique reports that the results obtained in 1921-22 were satisfactory having regard to the general crisis and the difficulty of further developing activity at the old works at Liége. The new installations at Herstal would be nearly completed in the new financial year, when the company would possess works with modern equipment. Among the orders received were those for a complete sub-station in Brussels and the supply of two 10,000-kW turbines for Ghent. A licence had been acquired for Belgium for the construction of the Swedish Ljungström turbine, and the company would be able to construct both the steam portion and the electrical parts of these machines. The net profits earned in 1921-22 amount to 2,112,000 fr. on share capital of 40,000,000 fr., as compared with 1,918,000 fr. in the previous year. It is proposed to pay a dividend at the rate of 30 fr. gross (6 per cent.) per share, being the same rate as in 1920-21.

Applications for British Trade Marks.—Appended is a summary of the recent applications for British trade marks in respect of goods and productions associated with the electrical trades and industries. Notices of objection to any of the applications can be entered within one month of the dates mentioned below.

Aristophone. No. 425,816. Class 8.—Wireless telephone and telegraph instruments and gramophones. C. F. Elwell, Ltd., Craven House, Kingsway, London, W.C. July 26th, 1922.

Parasol. No. 425,501. Class 13.—Sparking plugs. R. W. Robins and Co., Ltd., Park Place, Cardiff. July 26th, 1922.

Cosmos. No. 425,744.—All goods in class 16. No. 425,745. Class 50.—Electric insulators, electric insulating materials and preparations. Metropolitan-Vickers Electrical Co., Ltd., 4, Central Buildings, Westminster, S.W. July 26th, 1922.

Sunshine. No. 418,865. Class 6.—Electric vacuum cleaners and electric ironing machines. The Wise McCluny Manufacturing Co., 443, Park Street, New Philadelphia, O., U.S.A. (F. Heron Rogers, 181, Queen Victoria Street, London, E.C. August 2nd, 1922.

Magdynette. No. 425,961. Class 6.—Machines for electric current generation and ignition purposes. Joseph Lucas, Ltd., Great King Street, Birmingham. August 2nd, 1922.

De-Os. No. 423,525. Class 13.—Electric lamps (ordinary), parts thereof, electric lamp fittings, holders, shades, and reflectors. Osram Gesellschaft, 11-14, Ehrenbergstrasse, Berlin, O.17, Germany. (Cruickshank & Fairweather, 65-66, Chancery Lane, London, W.C.) August 2nd, 1922.

Ocelit. No. 426,094. Class 4.—Carbons for electrical purposes, and graphite, raw or partly prepared, for use in manufactures. Eugene Conradty, trading as E. Conradty, 9, Spittlertorgrabe, Nuremburg, Germany. August 2nd, 1922.

Lead.—Messrs. James Forster & Co., in their report dated August 5th, state:—"Consumption in the electrical cable trade has increased considerably since the engineers' strike, although it is now easing off. The domestic trade in sheet and pipe lead is on the increase, and more virgin lead than usual is being used in this direction, owing to a falling off of scrap lead. The market here is heavily 'bull,' which may affect values later, but we do not anticipate much change either way."

Importation of Machinery into Australia.—A deputation from the Iron Trades Council which waited upon the Premier of Victoria requested that contracts for machinery and other work should not be allotted to firms outside Victoria. Members, after stating that approximately 500 men in the trade were out of work, contended that more machinery was being imported by the Electricity Commission than was necessary. The Premier replied that every proposal to import machinery was carefully scrutinised by the Ministry. It had to be remembered that it would be better for the State to lose a few contracts than to overload unduly the capital cost of the Morwell electricity scheme.—*Reuter's Trade Service* (Melbourne).

Engineers' Wages.—As stated briefly in our last issue, a conference to discuss "payment by results" took place between the Engineering Employers' Federation and the A.E.U. on August 3rd. Although no official statement was issued, the *Daily Telegraph* understands that the suggested terms would have enabled the average skilled worker to earn at least 33⅓ per cent. more than the present time rates. The conference lasted throughout the day, but broke up without having reached any conclusion and without arrangements being made for its resumption.

It is to be noted, however, that under the terms of the last agreement the employers agreed not to enforce the piecework system for a certain period to enable the unions to consider the matter. As this term has now expired, it is anticipated that a certain number of employers will introduce payment by results without further discussion.

South African Electrical Trade.—According to the *South African Mining and Engineering Journal* for July 15th, the prices of electrical wares generally are firming. "Everybody to-day is selling goods which cannot be replaced at present prices. . . . . Germany seems finished for the time. One cannot get stuff from her, at any rate, not at the prices lately ruling. British prices are firming, too, and they were expected to advance locally within a short time." People who have been holding over their installations for lower levels seem now to be beginning to realise that prices will go no lower, but will rather advance and cost considerably more in about three months, and they are now about to rush in and get their jobs done cheaply. Many owners of houses and business plans, who have been hanging on for months for still lower prices, are now realising that they will not be able to obtain electrical wares cheaper.

LIGHTING AND POWER NOTES.

Ashford (Kent).—Electricity Supply.—The Urban Council has decided to engage a consulting engineer to prepare a report and scheme for an electricity undertaking for the town.

Australia.—Victoria.—The Electricity Commission has recommended the Victorian Government to proceed with the hydro-electric scheme for Goulbourn Valley and the north-eastern district of Victoria. The estimated cost of the undertaking is £962,000.—*Reuter's Trade Service* (Melbourne).

Bath.—Year's Working.—The total revenue earned by the electricity undertaking (engineer: Mr. F. Teague) during the year ended March 31st last was £50,810, comparing with £45,495 in the previous year. The expenditure on revenue account rose from £38,070 to £39,388, leaving a gross balance of £10,922 (£7,425). Capital charges amounted to £14,341, as against £9,396, causing a net deficit of £3,419 as compared with a loss of £1,971 in 1920-21. The amount of energy sold remained at about the same level, the figures for the past two years being 2,675,592 (1920-21) and 2,670,543 kWh.

Billericay.—Electricity Supply.—At a recent meeting of the Rural Council a letter was received from the Wickford and District Electricity Supply Co., Ltd., asking for the Council's sanction to an application for power to supply electricity to the district. The Council decided not to oppose the application.

Blackburn.—Year's Working.—The report of the borough electrical engineer (Mr. P. P. Wheelwright) for the year ended March 25th last states that the revenue totalled £116,446, as compared with £110,165 in 1920-21. Working expenses amounted to £87,282, as against £91,949, leaving a gross profit of £29,164 (£18,216). Capital charges, &c., absorbed £34,896, and crediting £1,391 bank interest, the net result was a deficit of £4,340, comparing favourably with a loss of £10,472 in the previous year. The capital account shows an expenditure of £368,136 upon the new station (described in our issue of October 21st, 1921), and £16,491 upon feeders, distributors, services, &c. The sales of energy totalled 10,244,361 kWh, as compared with 9,102,394 kWh, and the maximum demand rose from 6,005 to 6,394 kW.

Brazil.—Hydro-Electric Scheme.—In order to meet the increasing demand for electrical energy, the Brazilian Traction, Light and Power Co. has recently acquired the rights to utilise the water power of the River Parahyba, about 100 miles from Rio de Janeiro, for the development of 140,000 h.p. A new company, to be known as the Brazilian Hydro-Electric Co., is being formed to carry out the scheme, the whole of the shares, however, being held by the first-named concern.

Bolton.—Year's Working.—The accounts of the electricity undertaking (engineer: Mr. W. J. H. Wood) for the year ended March 31st last, show a total revenue from all sources of £269,237, as compared with £273,530 in the previous year. The working expenditure amounted to £166,166, as against £186,350 in 1920-21, leaving a gross balance of £103,070 (£87,180). Capital charges absorbed £84,400, leaving a net profit of £18,670 (£27,779). Of this balance £16,578 was appropriated as capital expenditure out of revenue, and the remainder carried forward. The energy sold increased from 30,208,980 to 31,876,014 kWh, a satisfactory increase, having regard to the depressed condition of industry.

Canada.—Ontario.—The Hydro-Electric Power Commission of Ontario has issued a report upon the Nipigon development, in which an ultimate plant capacity of 30,000 h.p. will be operated by the Cameron Falls. The Commission has been subjected to the criticism that the cost of power from this source will be higher than the contract price of power supplied by the Kaministiquia Power Co. In reply, the Commission states that the company was not in a position to deal with the demand in this district, but it admits that, owing to delay in commencing the work, the estimates have been exceeded by about 1¾ million dollars.

China.—Hanyang.—$150,000 is being raised at Hanyang, Hupeh, for the erection of an electric light plant. A preparation bureau has been established.

Colchester.—New Power Station.—The Town Council has engaged Mr. W. C. C. Hawtayne, M.I.E.E., to prepare a detailed scheme for the erection of the suggested new power station at the Hythe.

Continental.—Russia.—A Moscow journal says that from May 1st delivery of fuel has been made against payment to all the Petrograd factories, including the combination of the Petrograd town electricity stations. The result has been that this combination has been reduced financially to very low water. The quantity of energy sold by all the stations of the combination in the month of April amounted to 6,700,000 kWh. The expenditure on fuel considerably exceeded the revenue, amounting to 60,000,000 roubles, or more than twice the sum to be received for energy sold. The statement goes on to enumerate all the other outlays, amounting to about 100,000,000 roubles, against 28,000,000 roubles to be received, and then only in case of smooth working; that is to say, the income is 28 per cent. of the expenditure, to be added to which positive loss there is the credit taken by the subscribers, besides numerous deductions for one reason or another in payment of the accounts, all which, though enumerated carefully, would occupy too much space to recapitulate. The issue from the *impasse* that suggests itself is to rate the power relatively to the cost of its production. This, however, cannot be done, as the tariff is fixed by superior authority. All that can be done in reducing the cost of fuel has been done, says the report quoted. The fuel used now is considerably less than in 1921-20, 1919, or even 1917. And it is to be noted that the fuel now delivered to Petrograd is of exceedingly inferior quality. The petroleum is dirty and watery, and the peat contains a large proportion of earth. Further, it is impossible to effect more economies for want of piping, boilers, and economisers.

Dorking.—Proposed Price Increase.—Edmundson's Electricity Corporation has applied for power to increase the maximum charge for electricity from 10d. to 1s. per kWh, with a minimum payment of 15s. in the winter quarters and 10s. in the summer quarters.

Greenock.—Price Reduction.—The report on the working of the electricity undertaking for the past year shows a balance of £14,258, and the Electricity Committee has recommended a reduction in the charges for electricity of 1d. per kWh for lighting and ½d. per kWh for power.

Exeter.—New Sub-station.—The Town Council is constructing a large permanent sub-station at the Lower Market to replace two or three underground sub-stations in the neighbourhood which are incapable of further extension.

Farnborough (Kent).—Electricity Supply.—The Parish Council has under consideration a proposal put forward by the West Kent Electric Co., to supply the district and Keston and Hayes with electricity.

Formby.—Electricity Scheme.—The Urban Council has adopted a scheme submitted by Mr. James Scott, electrical engineer, under which a supply of electricity will be taken from the London & North-Western Railway Co. Mr. Scott is to prepare a report and plans for submission to the Electricity Commissioners.

Glasgow.—Exhibition Houses.—Following on the experiment at Riddrie, the Corporation proposes, in connection with the Mosspark housing scheme, to construct two houses with electrical appliances and two houses with gas. These will show visitors the extent to which electricity and gas can be used for domestic purposes.

Glossop.—Proposed Increased Charges.—The Urban Electric Supply Co. has applied to the Electricity Commissioners for power to increase the maximum charge for electricity from 10d. to 1s. per unit, with a minimum charge of 15s. for each winter quarter and 10s. for each summer quarter.

Hastings.—Loan.—The Town Council has applied to the Electricity Commissioners for sanction to borrow £3,483 for mains.

Helston.—Electricity Supply.—The Town Council has under consideration a proposal for lighting the town with electricity, and a meeting of the burgesses is to be called at an early date to ascertain what scheme would be acceptable, and whether it should be on the lines of a municipal undertaking.

Hoddesdon.—Electricity Scheme.—An electricity company is being formed for Hoddesdon, Broxbourne and district, which proposes to obtain electricity from the North Metropolitan Electric Power Supply Co. A capital of £5,000 is required before a start can be made with the scheme; about £2,000 has already been promised.

India.—Trichinopoly.—The Municipal Council, at a recent meeting, finally confirmed the terms of agreement with the Metropolitan-Vickers Electrical Co. for the introduction of electric lighting in the Trichinopoly municipal area. A local company will be floated and the Metropolitan Co. will manage the concern for a period of 15 years. The work will be commenced within three years and the company has agreed to supply power for all municipal purposes at a rate not exceeding 3 annas per unit, and for private services at 6 annas per unit.—*Indian Textile Journal.*

London.—St. Pancras.—There was a profit of £23,129 upon the past year's working of the electricity undertaking. It is proposed to distribute it as follows: Writing-off of balance of outstanding loan on certain plant, £3,182; transfer of £1,815 to the working balance, bringing it up to £10,000; transfer of £2,000 to reserve; and contributing the remainder, £16,132, to the relief of rates.

Southwark.—The report on the working of the electricity undertaking for the past year shows a surplus of £4,000.

Rawtenstall.—Revised Charges.—The Corporation has adopted the following scale of charges to power consumers:—500 kWh per month, 2.5d.; 1,000 kWh, 2d.; 2,000 kWh, 1.5d.; 1,500 kWh, 1.15d.; all additional energy, 1.1d. per

kWh. For demands exceeding 200 kW for consumers under agreement:—30,000 kWh per month, 1.05d.; 60,000 kWh, 1d.; 110,000 kWh, .95d.; 160,000 kWh, .9d. Over 160,000 kWh to 210,000 per month, .85d.; over 210,000 kWh, .8d.

Shrewsbury.—Price Reduction.—The Town Council has reduced the surcharge of 100 per cent. on the charges for electricity for all purposes to 75 per cent. as from the June quarter meter readings.

South Africa.—Pretoria.—The Municipal Council is seeking power to raise a loan of £750,000 for public works. It is proposed to allocate £400,000 for the installation of a power station.

TRAMWAY AND RAILWAY NOTES

Birkenhead.—Year's Working.—The report for the year ended March 31st last of the manager of the municipal tramways (Mr. C. Clarke) has come to hand. This shows that the total revenue was £137,845, as compared with £152,304 in the previous year. The total working expenditure amounted to £103,394, as against £116,060, leaving a gross profit of £34,451 (£36,244). Interest, sinking fund, and income tax absorbed £31,919 (£32,211), and the final result was a net profit of £2,532, as compared with £4,033. The number of passengers carried was 17,966,065 and the car-mileage 1,150,558; the previous year's figures were 22,182,390 and 1,286,921 respectively. It was found necessary during the year to raise the fares, but they have now been restored to their former level.

Exeter.—Extensions.—The Town Council has instructed the surveyor to submit an estimate of the cost of extending the tramway service to Hamlyn Lane, on the Pinhoe Road route.

London.—"Tube" Stations Closed.—During the present week, consequent upon the continuation of the reconstruction of the City & South London Railway, the following stations have been closed:—Euston, King's Cross, Angel, City Road, and Old Street (partly). To prevent inconvenience to passengers, an adequate special omnibus service has been instituted.

L.C.C. Tramways.—The Highways Committee recommends that application be made for a prolongation of the time allowed for the completion of certain tramway extensions authorised by the London County Council (Tramways and Improvements) Acts, 1909, 1910, 1914, and 1915.

Quieter "Underground" Trains.—According to the *Daily Mail*, Professor A. M. Low has successfully carried out experiments with a new system of car construction aiming at the reduction of noise on the "Underground" railways. It is expected that the companies will adopt the system in the design of future rolling stock.

Manchester.—Proposed "Tube" Railway.—The Manchester City Council is again considering the construction of an underground railway to relieve the traffic congestion in the city. It is stated that plans and approximate estimates have been made, the cost working out at between £750,000 and £1,000,000 per mile for a length of 15 miles. It is interesting to note that the city's tramway undertaking has only cost £2,000,000.

South Africa.—Pretoria.—The Municipal Council proposes to expend £50,000 on the tramway system, and power is being sought to raise a loan for the purpose.

TELEGRAPH AND TELEPHONE NOTES.

Canada.—New Wireless Stations.—Investigations are being made, says the *Electrical News*, for the purpose of erecting three wireless telephone stations in the northern parts of Manitoba, which would eventually link up with the wire system. One of these stations would be erected at The Pass, another probably at Norway House, and the third at Churchill, or another point to be decided on. The apparatus would be designed to deliver 500 watts to the antenna system; under proper transmitting conditions the stations would have a range of several hundred miles. It is hoped to have The Pass station, at least, in operation this year. Under present conditions communication north of the 53rd parallel is limited by the speed at which men or dogs can travel, in summer by canoe, in winter by sledge. Always during spring and "fall" there is a season of six weeks during which the formation or breaking up, as the case may be, of the ice renders any kind of travel impossible; thus, under present conditions during nine months of the year, communication between civilisation and the northern outposts is necessarily slow and arduous; during the remaining three months all communication is at a standstill.

France.—Regulations for Wireless.—The departmental committee appointed by the French Under-Secretary of the Post Office to inquire into the regulation of wireless installations, has drawn up its report. It is expected that rules based on the recommendations will shortly be issued. The broad principle followed is that receiving apparatus may be freely used after formal registration, while sending apparatus can only be installed by private individuals on the authorisation of the Under-Secretary of State acting on the advice of a mixed committee of officials and experts. Sending installations will be divided into five classes—private stations, stations for financial news, scientific stations, mobile stations (*e.g.*, ships)), and amateurs' installations. There will be a limit of wave length.—*The Times.*

New Wireless Station Opened.—Direct wireless communication between France and New York was established at midnight on August 6th by means of the wireless station at Saint-Assise. A few minutes after the message had been dispatched New York announced that it had been received at the rate of 80 words a minute, says *The Times.* The new station is situated near Melun, not far from the Forest of Fontainebleau, and has been named "Radio-France." The installation is 50 per cent. more powerful that that of Bordeaux. Three new sets of apparatus are shortly to be erected at the Saint-Assise station, which will then be four times more powerful than the Bordeaux station and 35 times more powerful than the Eiffel Tower station. From Saint-Assise five or six messages can be dispatched simultaneously, at an average rate of 100 words per minute per message. Thus it is computed that Saint-Assise can send 36,000 words an hour, or nearly 1,000,000 words a day.

This station will in future carry on all wireless communication between France and America, and is worked from Paris by means of the long-distance control system. The central office near the Bourse will pick up, by means of six receiving centres in the suburbs, messages destined for transmission from Sainte Assise, and will automatically pass them on across the Atlantic. In addition direct communication has already been established with Argentina and China. Another development of wireless telegraphy in France is the inauguration of direct communication between Bordeaux and Saigon, with a tariff over 2 fr. a word cheaper than the ordinary cable rates. The next step is to be the equipment of six colonial stations for transmission, which at present can only receive messages, at Martinique, Guinea, Rufisque, in West Africa, Djibouti, in East Africa, Brazzaville, in Equatorial Africa, and Tananarivo, in Meridional Africa. This work completed, it is proposed to construct, probably in 1926, two stations in the Pacific, which will complete the chain of communication linking up 90,000,000 inhabitants of France and her colonies.

Tibet.—Telegraphic Communication.—Telegraphic communication has been established between Lhasa, the capital of Tibet, and India.—*Daily Mail.*

The Telephone Service.—Public Call Offices.—There are approximately 11,400 public telephone call office cabinets in England, Scotland, and Wales; of the total 1,476 are situated in railway stations, on piers, and similar semi-public places that are privately owned, and 2,206 are in shops and on other private premises. In London there are 3,600 cabinets, of which 1,277 are official and 2,322 in railway stations, shops, and otherwise privately controlled. In Scotland there are over 900 cabinets.

Proposed Orkney Service.—Orkney is the only county in Scotland without a telephone service, but the *Orkney Herald* announces that an abridged outline of the proposed system to be installed at Kirkwall—and it presumes throughout the county—was recently given by the district manager of the service at Aberdeen. The Town Council has appointed a committee to consider the matter.

Uruguay.—State Telephone Service.—We learn from the *Review of the River Plate* that, although the matter has been kept very quiet it has transpired that an agreement has been entered into for the purchase by the State—or perhaps we should say by the Post Office—of the Uruguay Telephone Co., which is an English joint stock concern, and the oldest, and by far the largest, of the two telephone companies operating in Montevideo. The purchase price is $700,000. For the present the "Uruguaya" will be worked by the Western Electric Co. until the State subterranean system, for which the latter holds the contract, has been constructed, when the older company will be absorbed. The *Review* regrets the disappearance of a British enterprise that, with all its faults, has done good service in its time, and was the pioneer in introducing the telephone in Uruguay. Welcomed at first, of late years it has not received fair treatment at the hands of the Government—but it is not singular in that respect, for unfair treatment of foreign enterprises which stand in the way of Government plans of absorption is a phenomenon unfortunately not confined to Uruguay in the present day.

United States.—Cable Interruption.—Communication between the United States, Ireland, France, Germany, and Northern Europe, through the Commercial Cable Co., was interrupted on the morning of August 7th, probably because of the seizure of the station at Waterville (Ireland) by the Irish Irregulars.—*The Times.*

Wireless Restrictions.—When Congress reassembles this month it will consider the assignment of new wave lengths for use in the U.S.A., and will probably "zone" the country, or classify the broadcasting stations.—*T. & T. Age.*

Wireless Telegraphy.—New Imperial Chain Station.—The daily Press announces that negotiations are in progress by the Post Office authorities for the erection of a new long-range wireless station that will involve a capital outlay of £1,000,000 and an annual charge of approximately £500,000. The site for the new station will probably be at Bourne, Lincolnshire, and it is said that the aerials will be a mile long and half a mile broad. The suggested new station is probably the outcome of the Government's recent change in policy—namely, to increase the length of the "links" in the wireless "chain" of stations from 2,000 to 4,000 miles.

CONTRACTS OPEN AND CLOSED.

(The date given in parentheses at the end of the paragraph indicates the issue of the Electrical Review *in which the "Official Notice" appeared.)*

OPEN.

Australia.—Victorian Electricity Commission.—October 2nd. Ten surface feed-water heaters; 6 surface vapour condensers; 12 feed-water evaporators. (See this issue.)

December 18th. Victorian Electricity Commissioners. Supply of a complete brown coal-handling plant.

November 4th. Transformers, induction regulators, and switchgear. (See this issue.)

Brisbane.—September 20th. Postmaster-General's Department. Supply and delivery of switchboard apparatus and parts. (Sched. No. 559.)*

Melbourne.—Victorian Railways. October 11th. Electric storage battery with accessories and spares (Cont. 35,090). October 18th. Motor generator set and static transformer (Cont. 35,089.)*

Belgian Congo.—December 20th. Belgian Ministère des Colonies (5e Direction), 20, Rue de Namur, Brussels. Installation and operation of a system of electrical energy distribution at Elizabethville, in the Belgian Congo.

Czecho-Slovakia.—Kaaden.—Machinery and electrical equipment for new water-power station. Direktion des Städtlichen Elektricitäts, Kaaden, Czecho-Slovakia.

Edinburgh.—September 5th. Corporation. Conversion of two overhead cranes from mechanical to electrical operation. (August 4th.)

Huddersfield.—August 12th. Electrician's work required in conversion of premises, Northumberland Street, into picture theatre, for Freedman's Pictures, Ltd.—Stocks, Sykes and Hickson, architects, 1, St. Peter's Street, Huddersfield.

Leeds.—August 15th. Tramways Committee. Reconstruction of tramway track, Cardigan Road. Mr. J. B. Hamilton, general and commercial manager, 1, Swinegate, Leeds.

London. — Metropolitan Asylums Board. August 30th. Supply and erection of electric storage battery at the Grove Fever Hospital, Tooting Grove. (See this issue.)

H.M. Office of Works. September 5th. Supply of electrical and mechanical engineering labour in daywork in Cardiff. (August 4th.)

Islington.—September 20th. Electricity Department. Two water-tube boilers with stokers, draught system, steel chimneys, steam piping, &c.; cooling towers, ponds, pipework, &c. (See this issue.)

Manchester.—August 22nd. Tramways Committee. Permanent way points, tongues, crossings, and hardened steel centres; electrodes for welding. Mr. H. Mattinson, general manager, Corporation Tramways, 55, Piccadilly, Manchester.

August 24th. Electricity Committee. Two steel ash wagons and a lifting sling. (August 4th.)

August 31st. Electricity Committee. Supply and completion of two coal grabs. (Spec. B38.) (See this issue.)

Matlock.—August 17th. Sewerage Contract No. 11. Electric generators and motors and pumping plant for Urban District Council. Specifications, &c., from Messrs. J. Diggle and Son, Civil Engineers, 14, Brown Street, Manchester.

New Zealand.—October 24th. Mangahao Power Scheme. Copper wire. November 21st. Battery booster-transformer. Specifications may be obtained from the office of the High Commissioner.

October 3rd. Mangahao Power Scheme. Power-house and sub-station transformers; travelling electric cranes; ventilating fans; goods lift; and 110,000-V insulators.*

September 30th. Teviot Electric Power Board. One horizontal turbine, Francis type, coupled to a 125-kW, 3-phase, 50-cycle, 3,300-V generator; one 7.5-h.p. Pelton wheel; one 5-kW motor generator set; and complete switchboard and power station equipment.*

Wellington.—City Council. Erection of a large reinforced concrete power station at Shag Point.

Oxford.—August 15th. Oxford Electric Co., Ltd. One 1,000-kW turbo-alternator and condensing plant; and one 500-kW conversion plant (3,000 V, 3-phase, to 1,100 V, d.c.), complete with switchgear. (July 21st.)

Reigate.—August 22nd. Town Council. H.p. concentric and l.p. twin paper-insulated cable. (See this issue.)

Rochdale.—August 16th. Union. Installation of automatic telephone system at Dearnley Institution. (August 4th.)

Rumania.—Constantza.—Direction Général du Port. Six 3-ton electric cranes and two excavators (continuous current at 440 volts supplied by the Port authority). M. Erbiceanu, Director Général du Port de Constantza, Rumania.

Stockton-on-Tees.—August 31st. District Fund, Gas, and Electricity Committees. Stores, &c., for three months. (See this issue.)

Tasmania.—Hobart.—October 2nd. City Council. 750-kW rotary converter and transformer and 550-volt, d.c. switchboard panel. Further particulars are due to arrive at the office of the Agent-General for Tasmania, Australia House, Strand, London, W.C.2, about the middle of August.

Warrington.—August 14th. Electricity and Tramways Committee. High and low-pressure paper and lead-covered cable, and earthenware conduits. (July 28th.)

Wimbledon.—August 31st. Electricity Committee. One 3,000-kW turbo-alternator, condensing plant, and accessories. (July 28th.)

* A copy of the plan, specification, and conditions of tender, &c., can be inspected at the Department of Overseas Trade (Room 84), 35, Old Queen Street, S.W.1.

CLOSED.

Blackburn.—Board of Guardians. Accepted. Installation of standard electric lights and inside fittings.—C. T. Briscoe & Co.

London.—The Spearing Boiler Co., Ltd., has secured the contract for two water-tube boilers, each of a normal evaporation of 52,650 lb. per boiler, together with Ferguson superheaters, chain grate mechanical stokers, and forced and induced draught plant, for the Charing Cross, West End and City Electricity Supply Co., Ltd.

Northampton.—Town Council. Accepted:—A. Stark and Co., Ltd., for the reconstruction of certain tramways in the town (£5,971).

South Foreland.—Wiring the Old Lighthouse, South Foreland, residence of Sir Wm. Beardsell.—J. Martin, Dover.

NOTES.

Proposed Visit to Gennevilliers.—The Union d'Electricité (controlling the Gennevilliers power station) has found it necessary to alter the provisional date of September 22nd, and it is now probable that the visit will take place early in October. One of our representatives will be in Paris during this week to complete arrangements, which will be set out in an early issue and communicated to those who have already signified their intention of visiting the station.

Other engineers who are contemplating the visit should communicate with us as soon as possible, so that the approximate number may be known.

Appointments Vacant.—E.h.p. plumber-jointer, for the Wolverhampton Corporation electricity department; deputy city electrical engineer (£750 to £1,000), for the City of Bradford electricity department; shift engineer (£376), for the Lancashire Electric Power Co., Ltd.; South African Railway electrification: Engineer in connection with the transmission system (£700 to £850), engineer in connection with the distribution system (£600), engineer for the track equipment (£600). (See our advertisement pages to-day.)

Belgian Electrical Museum.—The Chambre Syndicate des Electriciens, with the support of the Société Belge des Electriciens, has nominated a committee to draft a scheme for the creation of a National Museum of Electricity. A free *locale* for the projected museum has been offered by the Union des Associations Internationales in the Palais Mondial au Cinquantenaire, at Brussels.

Fires.—Glasgow.—Damage was recently caused by fire in premises occupied by Messrs. Walker & Co., medical electricians, Garnethill, Glasgow.

Two buildings, containing electrical appliances, switchgear, &c., at the Aitken Colliery, Fifeshire, have been destroyed by fire. The electricity generating station, which supplies the driving and haulage power throughout a wide area, was saved.

530 Applications.—For the post of engineer, with electrical experience, able to do running repairs to motors (wage £4 5s. per week) in the Vale of Leven, near Glasgow, there were 530 applicants.

Fatality.—Thos. Basil Mather, aged 33, shift engineer at the works of the Lancashire Electric Power Co., Outwood, Radcliffe, Lancs., was cleaning a portion of the switchgear on Monday when he received a fatal shock.

North-West Midlands Electricity District.—The conclusion arrived at by the Electricity Commissioners as a result of the inquiry that was held at Wolverhampton in February last with respect to the above district, have come to hand too late for publication this week. Briefly, it may be said that the Commissioners are of the opinion that the district as provisionally determined should be confirmed (subject to minor modifications) and that the promoters' scheme (also subject to certain modifications) will materially improve the supply of electricity within the area. They approve of the proposal to immediately extend the system of interconnection now existing between generating stations in the district and of the proposal to construct the first section of a capital station at Rugeley.

A Joint Electricity Authority is to be constituted, but the Commissioners are unable to accept the Walsall Corporation's suggestion that there should be a separate district with a separate Joint Authority for the southern portion of the area. Moreover, it is thought that the proposed extension of the Birchills station would not be practicable. Fuller details will be given in our next issue.

Automatic Train Control.—On another page we summarise the report of the Automatic Train Control Committee appointed by the Ministry of Transport. It is interesting to note that a report on the same subject has recently been made by the U.S. Interstate Commerce Commission—which, however, does not issue recommendations, but *orders*. Forty-nine railroad authorities were ordered to install automatic train control systems, and although forty of them entered an appearance to show cause why the order should not be enforced, the only modification made was an extension by six months of the time given to complete the installation. The arguments against the order, according to the *Railway Review*, were that the art of train control had nowhere passed the experimental stage; costs were too high; the number of systems being so large militated against the selection of the best; and other points, characterised as "an attempt to establish all sorts of imaginary difficulties." The diverse character of the conditions upon the different railway systems precluded definite general estimates of cost, but the Commission instanced a number of cases in which automatic control had been installed. The Order made by the Commission gives a full specification of the purposes and requirements of any system of control adopted, and, in general, the points dealt with agree very closely with the recommendations of the British Committee. It is ordered that each company affected must file with the Commission, on or before January 1st, 1923, a complete plan of the signalling system employed, and upon the first day of every month thereafter a report must be submitted upon the progress made with the installation of automatic train control. The time for completion was originally fixed for July 1st, 1924, but, as stated, the date has been altered to January 1st, 1925.

Temperature Limits in Large Machines.—At the annual Convention of the A.I.E.E. at Niagara Fall, Ontario, in June last, Mr. P. Torchio, chief electrical engineer, New York Edison Co., reviewed the above subject, pointing out that the present Institute standards allow a maximum limit of 105 deg. C. for fibrous insulation and 125 deg. C. for mica insulation with an allowance of 150 deg. C., subject to special guarantees of the manufacturer. In high-voltage machines of large size, the effect of actual copper temperatures higher than 105 deg. C. may cause softening and disappearance of binding materials, bulging of insulation, and consequent powdering of insulation under periodic pounding of copper on softened material, and ionisation at voids so created. Operating experience of four large machines demonstrated the above effects to repeatedly take place in machines operating at copper temperatures of 150 deg. C. None of these effects were noted in machines operating at copper temperatures of 105 deg. C. or under. Two machines have safely operated for over three years at maximum copper temperatures of 130 deg. C. Incorrect conclusions may be made as regards the safe temperature limits by judging the performance of machines unless actual copper temperatures are known. Lower ambient temperatures and fractional loads may reduce the operating temperatures from 25 to 35 deg. below the assumed limits. Machines designed for high temperatures are less efficient than machines designed for low temperatures, in one instance the difference being as great as several hundred kilowatts at all loads. The calculation of ventilation of large machines is relatively uncertain; it is of importance to aim at a conservative limit rather than set it too near the danger point. From the standpoint of economy as well as for greater safety, it appears that large machines should not be operated at higher copper temperatures than 105 deg. C. This means that with outside air ventilation seldom exceeding 20 deg., the maximum standard limit with the standard reference of 40 deg. ambient should be 125 deg., equivalent to 85 deg. maximum rise at the copper. In all cases where the room air is close to 40 deg. the maximum copper rise should be limited to 65 deg. Other correlated and important features discussed incidentally in the paper are the typical proportionality of life at different temperatures for fibrous insulation, and the new tentative conventional allowance for reducing to maximum copper temperature, readings taken outside the insulation.

Metropolitan-Vickers Roll of Honour Unveiled.—The unveiling of the roll of honour in memory of the members of Metropolitan-Vickers Approved Society who fell in the war took place on August 2nd in the workmen's canteen of the company's Trafford Park works. There was a large assembly, including relatives of many of those who fell. The ceremony commenced with the reading, by the Rev. Henry Mitchell, M.A., of an appropriate passage from the ancient author of Ecclesiasticus. In the course of his remarks the chairman (Mr. R. W. Rowe) mentioned that during the period of the war, out of a total male membership of 2,301 covering that whole period, 924 men joined the Colours. Out of this large number 74 men failed to return, and, he added, it was to their memory that this tribute of regard was to be paid. On behalf of the members of the society, and in memory of the dead, whose names appear on the roll of honour, he therefore requested Captain Hilton (managing director of the company and president of the M.V. Approved Society) to unveil the memorial. Following the unveiling the Rev. Henry Mitchell pronounced a short dedication. An expression of appreciation of the two gentlemen who had been good enough to unveil and dedicate the memorial was given by Mr. A. Walmsley (secretary of the society). The singing of the National Anthem brought the ceremony to a close.

Service Notes.—Electrical Artificer Joseph H. Harpum, serving on H.M.S. *Vernon*, torpedo school ship at Portsmouth, was the only candidate who sat for the examination for warrant rank recently, and passed. It has been intimated that Lieut. H. R. Latimer (Electric Lights Co.) City of Edinburgh Fortress Engineers (Territorial Force) has relinquished his commission, to which he was appointed in the corps in 1915. He was for some time employed on the staff of the Scottish Command; he retains the rank of lieutenant.

The Metallic State.—Recent advances in our knowledge of the structure of the atom have added very little to the elucidation of the nature of the metallic state, and in this connection a very suggestive paper by Prof. C. A. Kraus, in the June number of the *Journal* of the American Chemical Society, will be of interest. According to modern views the metals owe their characteristic properties to the presence of negative electrons free to move within the body of the metal. Electronegative elements, such as chlorine, owe their characteristic property of forming anions to the fact that they are capable of forming stable complexes (the ions) with one or more negative electrons. Metallic properties may be expected only in such substances as do not contain sufficient electronegative elements to engage the negative electrons supplied by the more electropositive constituents, or otherwise, in which electronegative elements are lacking. The smaller the affinity of an element or group for the negative electron the more electropositive will it appear, and the more readily will it enter into reaction with more electronegative elements. The association of negative electrons with positive metallions, which is supposed to make up the structure of a metal, has some resemblance to a salt. At very low concentrations the negative electron may no longer possess the freedom of motion characteristic of the metallic state, and it is known, for instance, that mercury vapour is a very poor conductor. The metal may, under such conditions, exhibit salt-like properties, and intermetallic compounds may also show resemblances to salts. There are many such compounds which have properties in harmony with this view. The more electronegative elements in such compounds are supposed to have a negative charge. The compound Na_3Sb is then similar to Na_3N or Na_3P. The question is raised whether the apparent deviations of intermetallic compounds from the valency relations may not be due to the tendency of electronegative elements to form complexes. This is shown in the compounds NaN_3, KI$_3$, &c., and it is suggested that something of the kind occurs in such compounds as Na_4Sn, Na_2Sn, Na_4Sn_3, NaSn, and $NaSn_2$. The atoms in such complexes, however, may not all function in the same manner. The property of metallicity is not an atomic one; it is due to the negative electron, and the rôle of the positive constituent is a secondary one. Many reactions in liquid ammonia solution, and the existence of substituted ammonium amalgams and substituted ammonium radicals in liquid ammonia solution support the views expressed. As an example it is stated that tellurium reacts with a solution of sodium in liquid ammonia to form a white crystalline precipitate of the typical salt-like compound Na_2Te. On further addition of tellurium this goes into solution with the production of complex tellurides, Na_2Te_2 and Na_2Te_4, which form strongly coloured solutions, similar to those of alkali-metals, and when precipitated form solution exhibiting metallic properties.—*Nature*.

Wireless Ship Control.—One of the outstanding features of the naval exercises off the Isle of Wight on August 1st, was the control of the 16,500-ton *Agamemnon* by means of wireless at a speed of 15 knots from the destroyer *Truant*. It is said that the ship was not only steered in this manner, but that her engines were also started, stopped, and controlled while running, by the same means, the boilers being fired with oil fuel.

United States Water-power Development.—The Federal Power Commission reports that there is more water power development under way in the United States than at any previous period in the nation's history.

Applications for water-power developments filed with the Commission have reached a total of 321, and involve approximately 20,000,000 h.p., or more than twice the existing water-power installation of the country. In the last year, after the first flood of applications had come in, they aggregated 6,000,000 h.p. of proposed installation. Up to June 30th last, the report states, the Commission had authorised a total of sixty preliminary or survey permits and forty-nine licences, eighteen of the latter for transmission lines, the permits involving an estimated installation of 2,386,000 h.p., and the licences for power projects aggregating 1,932,000 h.p.—*Reuter's Trade Service* (Washington).

INSTITUTION NOTES.

Engineering Joint Council.—It is announced that proposals for closer co-operation amongst the leading engineering institutions, which have recently been under consideration, have now received the approval of the Institutions whose representatives met in conference, namely, the Institution of Civil Engineers, the Institution of Mechanical Engineers, the Institution of Naval Architects, and the Institution of Electrical Engineers, and that an Engineering Joint Council composed of representatives of these bodies has been formed.

Among the objects of the Joint Council will be to improve the status of engineers, to secure the better utilisation of their services in the country's interests and the appointment of properly qualified individuals to responsible engineering positions, and to prevent the unnecessary duplication of activities.

It is anticipated that, at a later stage, the number of bodies represented on the Joint Council may be increased, but this at present remains a matter for future consideration for the Joint Council and the institutions concerned.

Institution of Electrical Engineers.—Examination.—It is proposed to hold the Associate Membership Examination in London and at other places (at home and abroad) towards the end of October, 1922. Entry forms and full particulars can be obtained from the Secretary of the Institution, Savoy Place, Victoria Embankment, London, W.C.2.

OUR PERSONAL COLUMN.

The Editors invite electrical engineers, whether connected with the technical or the commercial side of the profession and industry, also electric tramway and railway officials, to keep readers of the Electrical Review *posted as to their movements.*

On Wednesday last week a very large and enthusiastic gathering was held at the Cannon Street Hotel for the purpose of making a presentation to Sir George Sutton, Bart., the chairman and managing director, upon whom so well-merited an honour was recently conferred by His Majesty the King. The presentation took place prior to a Bohemian concert, and it was made on behalf of the staff of W. T. Henley's Telegraph Works Co., Ltd., and Henley's Tyre and Rubber Co., Ltd. Mr. A. E. Salmon, the secretary, presided over a company numbering about 350. Those present included Mr. Percy Rosling (general manager), Mr. A. A. Campbell Swinton and Mr. W. J. Potter (directors), Mr. Henry Savage (manager of the Woolwich works), Mr. R. O. Wright (manager of the Gravesend works), Mr. C. H. R. Thorn (manager for India), Mr. J. Traxler (manager of the Tyre Co.), Mr. W. F. Bishop (the sales manager), the managers of the company's branches throughout the Kingdom, and a large proportion of the staffs from the company's head offices, Woolwich and Gravesend works and branches. As Lady Sutton entered the hall with Sir George she was presented with a handsome bouquet consisting of scarlet and white carnations, lily of the valley and asparagus fern. The presentation to Sir George took the form of an illuminated address and a silver inkstand.

The welcome given to Sir George and Lady Sutton was most enthusiastic. "He's a jolly good fellow" being most heartily sung. Sir George was deeply moved. Mr. Salmon, in asking Sir George to accept the address of congratulation from the staff upon the honour that had been conferred upon him, first welcomed Mr. A. A. Campbell Swinton, the new director. He proceeded to refer to the pride which all branches of the staff felt in the magnificent work which Sir George had done for the company. They were proud of the eminence to which he had attained in the electrical industry. Mr. Salmon said that he had been closely associated with Sir George for close upon thirty years, and was in a better position than almost anyone there to testify regarding the value of his work in bringing the business to its present huge proportions. Sir George had always been mindful of the interests of the staff. An announcement would shortly be made respecting the recently completed Foreman's Pension Fund, which scheme would ultimately cost the company close upon £40,000. The speaker referred briefly to the presence of Lady Sutton and her interest in the welfare of the staff, and subsequently read the terms of the illuminated address.

Sir George Sutton, on rising to reply, was greeted with long and hearty applause. He said he had been faced with many difficult positions in the course of his career with Henley's, but none was more difficult than that one. The history of Henley's company during the last forty years was the history of his own commercial career. Forty years was a long time. He believed he was the oldest servant in the service of Henley's company. The dignity which had lately been bestowed upon him had not been conferred solely because of the success which Henley's company had achieved. There were other reasons, but the basis of all of them was the success of the company, because it had been the success of the company that had made those other reasons possible—the public work and other things which he had been able to do notwithstanding the close service and attention given to Henley's company. Sir George proceeded to try to trace clearly the rise of the company, and to name those who had been associated with him in the development of the concern, from Mr. Henley—who died forty years ago—Mr. Hatton, and Mr. Salmon, to Mr. Percy Rosling, the present general manager.

The concert which followed the speeches was very successful, every item being greatly appreciated.

Sir Alexander B. W. Kennedy has joined the board of the Westminster Electric Supply Corporation, Ltd.

The marriage took place at St. Peter's Church, Dyrham, near Chippenham, on July 15th, of Mr. Percival Grice, A.M.I.E.E., second son of Mr. Grice, of Richmond House, Aylestone, Leicester, and Miss Beatrice Lena Millership.

According to Press reports Mr. Samuel Insull, of Chicago, is at present in London.

In the July issue of the *Telephone News*, of America, the following interesting remarks appear under the title "Telephone engineers honoured in America and England.":—

"An unusual measure of international tribute has been paid to the engineering forces of the Western Electric Co. and its allied companies. Coincident with the election of Frank B. Jewett, vice-president in charge of engineering and manufacturing departments, to the presidency of the American Institute of Electrical Engineers, word has been received from the other side of the Atlantic of the selection of Frank Gill, European chief engineer of the International Western Electric Co., to head the Institution of the Electrical Engineers in Great Britain. Mr. Jewett, who is one of the best-known telephone engineers in the United States, was elected a vice-president and director of the Western Electric Co. last year after a score of years' activity with the Bell system. He was appointed assistant chief engineer in charge of all development and research work at the laboratories of the American Telephone & Telegraph and Western Electric Companies in 1912, and four years later was made chief engineer. During the war Dr. Jewett served as a colonel in the signal corps. He was an advisory member of the Special Submarine Board of the Navy, and contributed much toward the perfection of devices for detecting hostile submersibles. The perfection of wireless telephony is one of the greatest undertakings completed under his supervision. Mr. Gill has been associated with the International Western Electric Co. since July, 1919, when he took over the supervision of all its many extensive engineering problems throughout Europe, Africa, and the Near East. Prior to that date he had been a member of the firm of Gill & Cooke, the well-known electrical engineers, of London. Mr. Gill was for many years chief engineer of the National Telephone Co., of Great Britain, and only severed his connection with the active side of telephone operation when the system was taken over by the British Government."

Mr. John J. Ash has left the British Thomson-Houston Co., Ltd., where he was employed for many years in their Industrial Control Department. He has now entered into partnership with Mr. R. J. D'Arcy Hart, M.A., A.M.I.C.E., at 70, Victoria Street, London, S.W.1, where they are carrying on business as engineers under the name of Ash & Hart.

The marriage of Dr. J. W. Nicholson, F.R.S., president of the Röntgen Society, and vice-president of the Physical Society to Dr. Dorothy Wrinch, who is described as the first woman lecturer in mathematics at Cambridge, took place at Surbiton on Wednesday last week.

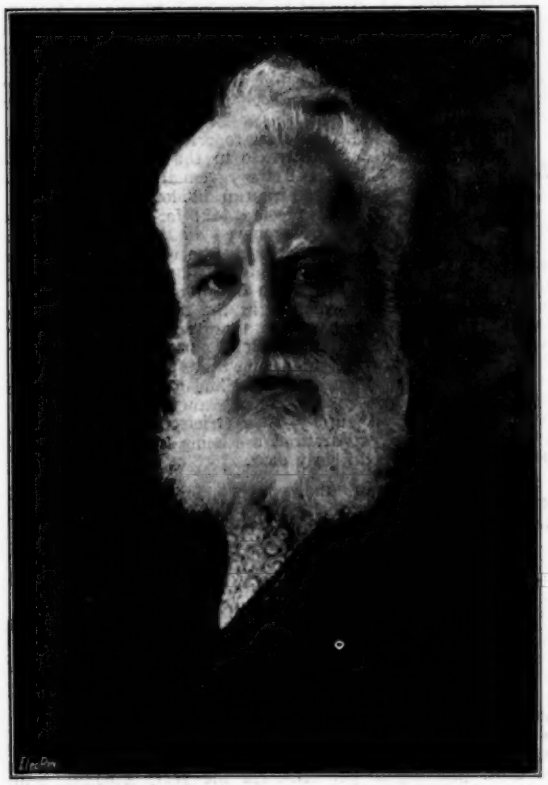
Obituary.—Alexander Graham Bell.—With deep regret we announced in our last issue the death, on the 1st inst., of the inventor of the telephone.

Alexander Graham Bell was born in Edinburgh on March 3rd, 1847, the son of Alexander Melville Bell, author of "Visible Speech," and grandson of Alexander Bell, author of "The Practical Elocutionist." Graham Bell followed the profession of a teacher of elocution as had his father and grandfather before him. The successive generations of the family advanced the art in accord with the developments of science and, in preparation for his subsequent career,

Graham Bell's educational course included the principles of anatomy, and the practice of music. Sound in general and speech sounds in particular were matters of much interest to him in his early years. As an exponent of his father's method of "visible speech" he became as a boy acquainted with Alexander Ellis and also with Wheatstone, who aroused his interest in speaking machines.

On the acoustic side Bell was well equipped to investigate the transmission of sounds, but he had no electrical experience. With a view to repeating Helmholtz's experiments in the transmission of vowel sounds he experimented, in 1867, with ordinary telegraph apparatus in the vain effort to cause the continuous vibration of a tuning fork by means of electro-magnets.

In August, 1870, Bell's father left England with his family and took up his residence in Canada, near Brantford, Ontario. In the following year Graham Bell was in Boston advising the Board of Education regarding the application of his father's system of visible speech in the teaching of deaf mutes. It was in Boston that his earlier interest in the electrical transmission of sounds was revived, and he conceived the idea of a system of multiplex telegraphy by means of tuning forks of different pitch. As his experiments progressed his aims widened, and he sought the transmission not merely of



The Late Alexander Graham Bell.

telegraphic signals but of the voice itself. He wrote to his parents on March 18th, 1875: "Such a chimerical idea as telegraphing vocal sounds would indeed to most minds seem scarcely feasible enough to spend time in working over. I believe, however, that it is feasible, and that I have got the cue to the solution of the problem." The acoustic side was well within his grasp. How to transform the undulatory aerial wave into an electrical equivalent and re-transform to an aerial wave again was his immediate quest. In the same letter, above quoted, he records his interview with Prof. Henry. "I felt so much encouraged by his interest that I determined to ask his advice about the apparatus I have designed for the transmission of the human voice by telegraph. I explained the idea, and said 'what would you advise me to do, publish it and let others work it out, or attempt to solve the problem myself?' He said, he thought it was 'the germ of a great invention,' and advised me to work at it myself instead of publishing. I added that I felt that I had not the electrical knowledge necessary to overcome the difficulties. His laconic answer was 'Get it!'" That Bell got it the world knows, and that he was not long in getting it may be seen from the fact that his patent bears date within a year of his letter, and this patent covered all practical methods of speech transmission.

Remarkable as was the invention perhaps the characteristics of the inventor were still more remarkable. He restrained his enthusiasm within the comprehension of his financial supporters, who sought multiple telegraphs as a paying proposition, and would have regarded the attempt at speech transmission as energy wasted and money thrown away. But when the feat was accomplished they were able to realise its value and promote its use for the benefit of the world, the inventor, and themselves. He outlined the exchange system in a letter to the London financiers who were promoting the business here, but he contented himself with suggesting that the private lines then contemplated should be run through a central office, permitting subsequent intercommunication when the time was ripe for it. Bell was remarkable, too, for his modest bearing. He was content to have accomplished, and never enlarged upon his claims. He entered into no angry controversy with rivals, nor sought credit from later developments which had followed in the train of his own invention.

In later years, as our photograph shows, Bell had acquired a leonine appearance, but this was more than misleading. He had a quiet confidence and a graceful charm which were attractive to all who came in contact with him. On one of his infrequent visits to the land of his birth and training, though no longer his home, he spoke during an evening spent with a few electrical friends less about the telephone than about the developments of flying machines, then in the future, but in his view capable of accomplishment. On his last visit to London (in 1920) he attended a meeting of the Wireless Section of the Institution, and addressed the members in characteristic strain, relating that whilst he looked back upon the telephony of the past, the Wireless Section could look forward to an important share in the telephony of the future. It may be recalled, however, that the first wireless telephone was Bell's own photophone, exhibited to the members of the Institution on December 8th, 1880.

It is reported that on Friday evening last the whole of the telephone service throughout Canada and the United States was suspended for one minute as a tribute to the inventor.

Mr. Bernard Godfrey.—We regret to read in *The Times* of the death of Mr. Bernard Godfrey, M.Inst.C.E., M.Inst.Mech.E., M.Inst.E.E., which occurred recently at Hindhead. Mr. Godfrey served his pupilage in engineering with Messrs. Quick & Son. In 1876 and 1877 he was assistant engineer under Messrs. Harding & Co., contractors, in Paris, and he superintended the construction and running of the first steam tramways in that city. From 1878 to 1880 he was engineer and manager in London for the Lontin Electric Light Co., erecting and working some of the first public electric lighting installations in London, at Aldersgate and Moorgate Street Stations, the old Gaiety Theatre, and the Opera House. In 1881 he became a partner in the firm of Messrs. J. & E. Hall, engineers, of London and Dartford, and subsequently managing director of J. & E. Hall, Ltd.

NEW COMPANIES REGISTERED.

Home Radio and Electric Co., Ltd. (183,510).—Private company. Registered August 1st. Capital, £2,000 in £1 shares. To carry on the business of wholesale or retail sellers, installers and suppliers of apparatus for wireless telephony and telegraphy and any other telephonic or electric, magnetic, galvanic, mechanical and other apparatus and appliances, &c. The first directors are: A. F. Wood, "Dagfa," Beeston, Notts. (director of British L.M. Ericsson Manufacturing Co., Ltd.); M. S. Pierce, 233, Wright Avenue, Toronto, Canada; G. L. Crowe, "Beech Hollow," Oatlands Park, Weybridge, Surrey; J. H. Reed, 37, Friern Road, Dulwich, S.E. Registered office: Walter House, 418-422, Strand, W.C.2.

Car Electrical Service, Ltd. (183,501).—Private company. Registered August 1st. Capital, £500 in £1 shares. To carry on the business of manufacturers of and dealers in dynamos, electric motors, batteries, generators of electricity and electric lighting and starting sets and apparatus for motor cars, automobiles, lorries and charabancs, &c. The first directors are: W. D. Oddy, 47, Gledhow Wood Grove, Leeds; R. D. Fairclough, 8, Park Road, Dewsbury (both directors of Wilson, Hartnell & Co., Ltd.); S. Hoggart, 22, Dorset Avenue, Harehills, Leeds. Solicitors: J. Hepworth, 14, Butts Court, Albion Street, Leeds. Registered office: 11, New Station Street, Leeds.

Wilson Hartnell (Installations), Ltd. (183,479).—Private company. Registered July 29th. Capital, £100 in 1s. shares. To acquire the installation business carried on by Wilson, Hartnell & Co., Ltd., and to carry on the business of electricians, mechanical and electrical engineers, manufacturers and workers of and dealers in electricity, motive power and light, &c. The first directors are: R. D. Fairclough, 8, Park Row, Dewsbury; W. D. Oddy, 47, Gledhow Wood Grove, Roundhay, Leeds (both directors of Wilson, Hartnell & Co., Ltd.). Registered office: 11, New Station Street, Leeds.

Northern Auto Electric Services, Ltd. (183,463).—Private company. Registered July 29th. Capital, £5,000 in £1 shares. To carry on the business of motor ignition specialists, manufacturers of insulated wires and cables and all forms of wire and cable casings, electric light and general engineers, &c. The first directors are: C. S. Ramsden, Osborne House, Alderley Edge, Cheshire; E. J. Chambers, Houghton Lane, Worsley Road, Swinton, Lancs.; W. H. Hodgson, 61, Eccles Old Road, Pendleton, Lancs. Qualification: £250. Remuneration as fixed by the company. Secretary: T. Clough, 6, Slater Street, Failsworth.

Dunn & Co., Cheltenham, Ltd. (183,535).—Private company. Registered August 2nd. Capital, £2,000 in £1 shares. To acquire the business of electrical and general engineers carried on by A. E. Dunn at 21, Bath Street, Cheltenham, Glos. The permanent directors are: W. E. Thomson, Chalfont, Cheltenham; A. E. Dunn, Birdlip Place, Bath Road, Cheltenham. Remuneration as fixed by the company. Registered office: 21, Bath Street, Cheltenham, Glos.

Electricians, Ltd. (183,536).—Private company. Registered August 2nd. Capital, £100 in 5s. shares. To carry on the business of electrical engineers in all its branches. The permanent directors are: A. S. Newman, 60, Vine Street, Uxbridge, electrical engineer; A. J. Taylor, Eathy Villas, Otterfield Road, Yiewsley, general engineer; J. R. Buckeldee, Ivy Cottages, Hillingdon, hot water fitter. Registered by C. Doubble, 14, Serjeants' Inn, E.C.

Midland Wireless Manufacturing and Supply Co., Ltd. (183,482).—Private company. Registered July 31st. Capital, £400 in £1 shares. To carry on the business of wireless electrical engineers and manufacturers, workers and dealers in wireless apparatus of all kinds, &c. The first directors are: A. Davies, 18, Park Street, Uttoxeter, Staffs.; A. Birkett, Thomas Street, Hanley, Stoke-on-Trent; N. Birkett, Thomas Street, Hanley, Stoke-on-Trent; E. Y. Birkett, Thomas Street, Hanley, Stoke-on-Trent. Qualification: 10 ordinary shares. Solicitor: J. W. Moxon, Hanley.

Joclax, Ltd. (183,476).—Private company. Registered July 31st. Capital, £500 in 475 6 per cent. cumulative preference shares of £1 each and 500 ordinary shares of 1s. each. To acquire and turn to account any invention relating to electrical and other advertising signs and devices, and to carry on the business of electrical, mechanical and other engineers, founders, manufacturers of electric and other signs and devices, implements and machinery, &c. The first directors are: A. J. Barnett, 23, Cumberland Terrace, Regent's Park, N.W.7; S. Jones, Rowland Hotel, Craven Street, Bayswater, W. Remuneration as fixed by the company. Registered office: 80, Bishopsgate, E.C.

Motors Machinery and Metals, Ltd. (183,516).—Private company. Registered August 1st. Capital, £5,000 in £1 shares. To take over (1) the business of a general engineer, manufacturer of engineering specialities, millwright and dealer in machinery and motor cars carried on by H. G. Smith at Chiswick Park Works, Kent Road, and 40, Rothschild Road, Acton Green, and also the rights of the said H. G. Smith in a patent No. 13,186, of 1922, relating to a swivel vice; (2) the rights of Elizabeth F. Cavender and A. E. Thompson in a provisional patent No. 26,424, of 1921, for economising petrol with reference to internal-combustion engines; and (3) the rights of W. H. Cavender and H. G. Smith in a provisional patent No. 17,807, of 1922, being an improvement relating to distribution for electric ignition for internal-combustion engines. The subscribers (each with one share) are: H. G. Smith, 164, Goldhawk Road, W.12, engineer; W. H. Cavender, 48, Wallingford Avenue, North Kensington, W.10, engineer. The company is to appoint the first directors. Qualification: £250. Remuneration as fixed by the company. Registered office: Chiswick Park Works, Kent Road, Acton Green, W.

Astro Electric, Ltd. (183,472).—Private company. Registered July 31st. Capital, £20,000 in 15,000 9 per cent. cumulative participating preference shares of £1 and 100,000 ordinary of 1s each. To carry on the business of manufacturers of and dealers in machinery and plant, agents, electrical engineers, electricians, &c. The permanent directors are: L. M. Colman, Queen Annes Mansions, S.W. (chairman); D. M. Colman, Queen Annes Mansions, S.W.; A. G. France, 153, Clarence Gate Mansions, N.W.1 (managing director) (all directors of Astro Intensifier, Ltd.); H. A. Geaussent, 15, Netherall Gardens, Hampstead, N.W.; R. G. Lock, United Services Club, Pall Mall, S.W.1 (both directors of Overseas Sales, Ltd.). Remuneration: £100 each per annum (chairman and managing director £400 each). Registered office: Carlton House, Lower Regent Street, S.W.1.

OFFICIAL RETURNS OF ELECTRICAL COMPANIES.

E. N. Bray, Ltd.—Particulars of £3,000 debentures authorised July 1st, 1922, charged on the company's undertaking and property, present and future, including uncalled capital, whole amount issued.

Cirencester Electric Supply Co., Ltd.—Particulars of £6,000 debentures authorised April 25th, and covered by trust deed dated July 7th, 1922, charged on the company's undertaking and property, present and future, including uncalled capital; present issue £2,300. Trustees: Major F. W. B. Cupps, D.S.O., Waterton House, Glos.; and L. C. Wrigley, The Barton, Cirencester, Glos.

Pleno, Ltd.—Mortgage dated July 27th, 1922, to secure £500, charged on freehold land with factory and premises erected thereon in Ankers Street, Nuneaton. Holder: E. H. Guest, The Lindens, Beeches Road, West Bromwich.

Cambrian Electrolytic Zinc Co., Ltd.—Particulars of £6,000 debentures authorised April 21st, 1922, charged on the company's undertaking and property, except uncalled capital; present issue £2,120.

British Illuminated Sign Co., Ltd.—R. Stephens, of 31, Lombard Street, E.C.3, was appointed receiver or manager on July 20th, 1922, under powers contained in debenture dated August 8th, 1921.

British Mica Co., Ltd.—Particulars of £800 debentures authorised July 6th, 1922, charged on the company's property, present and future, including uncalled capital; whole amount issued.

Orbit Electrical Co., Ltd.—Satisfaction in full on July 21st, 1922, of debentures dated July 1st, 1919, securing £6,000.
S. Thompson, of 37, Lime Street, E.C.3, ceased to act as receiver or manager on July 24th, 1922.

F. E. Baker, Ltd.—Debenture dated June 29th, 1922, to secure £110,000, charged on the company's undertaking and property, present and future, including uncalled capital. Holders: William Beardmore and Co., Ltd., 36, Victoria Street, Westminster, S.W.

Townson & Chadwick, Ltd.—Debenture dated July 15th, 1922, charged on the company's undertaking and property, present and future, to secure all moneys not exceeding £2,300, which J. Brandwood, of "Brandlesholme," Bury, may be called upon to pay under his guarantee to the company's bankers.

McWhitaker, Ltd.—Satisfaction in full on July 26th, 1922, of debenture dated August 5, 1921, securing £400.

CITY NOTES.

Kalgoorlie Electric Tramways, Ltd.

The annual meeting was held on August 1st. Mr. A. H. P. Stoneham, who presided, related the labour troubles which had forced the company to entirely close down the system for three and a-half weeks, resulting in a considerable loss of revenue. In addition to these circumstances there was also a reaction from the great mining activity of the previous year, which further reduced the income. Owing to taxation the net profit was reduced, but a comparison of the operating profits of the two years showed that the position was not so unfavourable. Under the new miners' award wages in the industry were stabilised for three years, and this should result in increased employment, as the companies would be able to consider reorganisation. The present agreement with their own employés expired at the end of June, and although the Australian Tramway Association had fixed rates for a further period, it looked as though negotiations would have to be entered into. In conclusion, Mr. Stoneham said that, so far, the receipts of the current year were an improvement upon those of the same period of last year, but the latter, of course, included the strike period.

Yorkshire Electric Power Co.

The report for the half-year ended June, 1922, states that the sale of electricity largely increased during that period, and the price charged was substantially reduced, due to the lower cost of coal. A clause varying the price with the cost of coal has for some years been included in the company's supply agreements. The profits show a satisfactory increase, and the progress of the undertaking is reflected in the general improvement in the market value of all securities issued by the company. Interim dividends at the rate of 3 per cent. for the half-year will be paid on the ordinary shares and upon the preference shares issued prior to 1922. The issue in February of £558,360 cumulative preference shares was considerably over-subscribed. Negotiations are proceeding between the various authorities concerned in the West Riding (Aire and Calder) Electricity District, which it is hoped will lead to unanimity when the matter again comes before the Electricity Commissioners for final settlement. On May 31st the Yorkshire Electric Power Act, 1922, received Royal Assent. The Act increases the nominal share capital of the company from £2,000,000 to £4,000,000, with an increase in borrowing powers up to one-third, and the £10 ordinary shares and £5 preference shares become respectively converted into ten ordinary and five preference shares of £1 each. Certificates for shares issued prior to this year are now being exchanged. Certificates for the new preference shares will be ready for exchange early next year.

Electrical Distribution of Yorkshire, Ltd.

The directors report that there has been a large increase in the demand for electricity, and the revenue justifies the payment of an interim dividend of 3½ per cent. (free of income tax) for the six months ended June 30th, 1922. In March last an issue of £47,799 in ordinary shares was made, increasing the issued share capital to £150,000. The issue was considerably over-subscribed, and there has been a large increase in the number of shareholders and a satisfactory improvement in the market value of the shares. A special order has been approved by the Electricity Commissioners, amending the Orders obtained in 1915 for Selby and District and Stanley, and in 1917 for Featherstone, Garforth, Horbury, Otley, Penistone and Rawdon, permitting the company to proceed with the necessary works for supply in those districts. A supply of electricity is already being given in Otley, and preparations are being made to supply in the other districts at an early date.

Marconi's Wireless Telegraph Co., Ltd.

In their report for the year ended December 31st, 1921, the directors again draw attention to the many matters which still remain unsettled, with the result that the accounts once more do not reflect the true strength of the company's position. The credit balance of profit and loss account for the year amounted to £275,361, which, added to the balance brought forward, leaves to the credit of profit and loss account £1,093,928, subject to Corporation profits tax and income tax. From this have to be deducted the dividend on the preference shares 7 per cent. paid on January 31st, 1922, £17,500, and that on the ordinary shares (5 per cent.) paid in January, £131,555, leaving available for distribution £944,873. The directors now recommend payment of further dividends on the ordinary shares of 10 per cent. (making 15 per cent. for the year) £265,543, and 5 per cent. on the preference shares (making 12 per cent. for the year) £12,500, leaving to carry forward £666,830. The directors have carefully considered the value at which the shares and debts due by associated and other companies are entered in the balance sheet, and are of the opinion that in the aggregate they are worth not less than that amount. Patents and rights figure in the accounts at £283,691, and the directors are of opinion that their value considerably exceeds that sum. The report reads: "The past year has been one of unprecedented difficulty. The uncertain political conditions, the unstable exchanges, and the financial stringency which have obtained in almost all countries throughout the world, have not only limited the scope of such a business as ours, so largely dependent in the past on governments, but have also rendered every transaction difficult and anxious, calling for unusual caution. A settlement with our own Government in the circumstances would have been welcome, and would have greatly relieved the difficult period through which we have passed. Your directors, however, regret that they have again to inform you that no settlement has been made by any of the Government departments in respect of any of the company's claims arising out of the war or the services rendered during the war, and no sum, therefore, in respect of any of these claims figures in the past year's accounts. Negotiations are continuing, and your directors would welcome the opportunity of adjusting many matters which must be as irksome and costly to the Government as they are to the company. Several of our associated companies, in consequence of the state of trade and labour difficulties which were experienced during the last year, have

required further financial assistance, which has been afforded them by the company, and for which reasonable interest has been charged. Substantial improvement has manifested itself during this year, which has every appearance of being maintained, and lends considerable encouragement to the future. The facilities afforded by the Postmaster-General to 'broadcasting' in this country are warmly welcomed by your directors. They afford for the first time the opportunity to the company to supply on a large scale wireless instruments to the general public, and should represent a new and important source of revenue. The advent of this new industry should also prove of substantial value to all our subsidiary companies."

Meeting: August 15th.

Swiss Companies.

The *Société de l'Industrie Electrique et Chimique*, of Geneva, has decided to pay a dividend at the rate of 10 per cent. for 1921-22, being the same as in the preceding year.

The *Usine Electrique Clees*, of Yverdon, proposes to pay a dividend at the rate of 8 per cent. for 1921-22 out of net profits of 212,000 fr., comparing with 7 per cent. and 205,000 fr. respectively in the previous year.

The directors of *Brown, Boveri & Co.*, of Baden, after writing off 5,470,000 fr. for depreciation in 1921-22, as against 5,400,000 fr., report net profits of 1,080,000 fr., as contrasted with 670,000 fr. in 1920-21. It is not proposed to make any distribution for the year.

The *Motor Company for Applied Electricity*, of Basle, after having written off 776,000 fr. for depreciation in 1921, reports net profits of 242,000 fr. Of this amount 200,000 fr. has been applied to the redemption of the deficiency on foreign currency account and the balance carried forward.

Prospectuses.—*The Elgin Electric Supply Co., Ltd.*—The list of subscriptions in an issue of 15,000 shares of £1 each at par was to close on or before August 10th. With the consent of the Town Council a Special Order is being obtained from the Ministry of Transport for generating and supplying electricity in the City of Elgin. Information received from Edmundson's Electricity Corporation, Ltd., shows that an initial expenditure of £15,000 will be required, and that a "reasonable dividend" may be expected. An agreement has been entered into with Edmundson's as to the terms on which they will carry out the installation of works. The directors have been calling for support from the people of Elgin through the medium of this prospectus. Mr. A. N. Rye, electrical engineer, of London, is a director, as is also Mr. E. J. Williams, M.I.E.E., the Scottish district manager of Edmundson's Corporation.

Melbourne Electric Supply Co., Ltd.—This company has this week advertised in the financial Press particulars of an issue of £300,000 six per cent. redeemable general mortgage debenture stock, not for the purpose of inviting public subscriptions, but to comply with the requirements of the Stock Exchange.

Stock Exchange Notices.—Application has been made to the Committee to allow the following to be officially quoted:—

British Thomson-Houston.—1,000,000 7 per cent. cumulative preference shares of £1 each, fully paid (Nos. 1 to 1,000,000).

Dealings in the following have been specially allowed by the Committee under Rule 148A:—

Electrical Apparatus Co.—3,134 eight per cent. cumulative preference shares of £1 each, fully paid, Nos. 1 to 3,134; and 29,214 new eight per cent. cumulative preference shares of £1 each, partly and fully paid, Nos. 3,135 to 32,349.

Yorkshire Electric Power Co.—£117,000 5½ per cent. redeemable debenture stock.

The undermentioned have been ordered to be officially quoted:—

General Electric.—£94,210 6½ per cent. "A" cumulative preference shares of £1 each, fully paid (Nos. 1,705,791 to 1,800,000), and 177,109 7½ per cent. "B" cumulative preference shares of £1 each, fully paid (Nos. 1,622,892 to 1,800,000).

W. T. Henley's Telegraph Works Co., Ltd.—Dividend on the preference shares at the rate of 4½ per cent. per annum, less income tax, for the half-year ended June 30th; interim dividend on the ordinary shares of 1s. per share, less income tax.

The Swedish Radio Company.—The Svenska Radio A.B. reports that the reconstruction works, which were begun in 1919 and 1920, were continued in 1921, and the sale of complete radio stations and of receivers was also commenced. The company has acquired the sole rights for Sweden of the patents of Marconi's Wireless Telegraph Co. During 1921 the company earned net profits of 1,160 kr., which sum has been applied to the reduction of the loss brought forward from 1920.

East Anglian Electricity, Ltd.—The annual meeting was held at Ipswich on August 3rd. Mr. W. R. Bradbrook (chairman), in the course of his speech, said that substantial progress had been made during the year, the profits having increased by £1,100, and still better results were expected from the current year's working. The company was finding it difficult to meet the growing demand, but the Electricity Commissioners had approved a scheme of plant extension which would prove beneficial both to the public and to the company. At a subsequently extraordinary meeting a scheme to issue £30,000 of ordinary shares as 7 per cent. accumulative shares was approved.

Consolidated Electrical Co., Ltd.—According to the *Financial Times* the net profit to March 31st was £3,476, making available, with £1,015 brought forward, £4,491. A dividend of 2 per cent. is to be paid, carrying £1,391 forward.

City of Buenos Aires Tramways Co. (1904).—Dividend of 1s. 3d. per share (at the rate of 5 per cent. per annum), less tax, for three months ended June 30th.

STOCKS AND SHARES.

Tuesday Evening.

The August Bank Holiday week is an appropriate time for reviewing what has happened in the world of electrical stocks and shares since 1921 ended. The main feature, so far as electricity supply shares are concerned, is the manner in which prices have gone steadily higher almost week by week, with scarcely a glance backward. The various labour troubles which occurred in the early part of the year were disregarded as a market factor. The dividend declarations for the final half of 1921 were in every case satisfactory. They had the effect of confirming the confidence with which proprietors of these investments looked forward to the future. This confidence has lately been emphasised by the announcement of increased interim dividends by some of the leading companies.

The Westminster Electric Supply Corporation has very fairly stated that the increase in its own interim dividend must not be interpreted as turning into a certainty the hope that the full dividends for 1922 will exceed those of the previous twelve months. It may be that certain of the companies are announcing these improvements in order to bring into greater equality the amounts distributed in each half-year. Nevertheless, prices continue to advance, and, as it has been said here *ad nauseam*, the great difficulty is to obtain supplies of shares. The County of London Company's issue of new ordinary at 22s. 6d. and of new preference at 20s. is welcomed as affording the opportunity for a wider market to be created in the company's issues. The price of the ordinary has risen to 2s. 6d. premium and the preference to 1s. 3d. premium. These prices are sufficient evidence, in themselves, of the readiness of investors to take good stock offered at reasonable figures. It is probable that in the near future there will be other issues of the same kind.

To proceed with our customary tables. We add, and we hope it will be for the last time, the prices of July 27th, 1914, the date immediately preceding the outbreak of war. The figures are interesting enough, and the comparison with values that obtained just eight years ago will stir a good many recollections. However, the Stock Exchange pre-war engagements come up for a final settlement on the first day of next month; and, after that, the decks, again from the Stock Exchange point of view, will be cleared from pre-war entanglements.

Home Electricity Companies.

Share.	July 27th, 1914.	Dec. 31st, 1921.	Aug. 8th, 1922.	Rise.
Brompton & Kensington	9¼	6⅝	7½	⅛
Charing Cross	5½	4⅛	7⅛	2⅛
Chelsea	4⅛	3¼	6	2¼
City of London ...	—	1 7/16	2 1/32	19/32
County of London ...	12	8⅛	1⅛	9s. 9d.
Kensington	7½	5½	7½	2
London	1 7/16	1	2½	1½
Metropolitan	3½	3⅛	5½	1⅛
St. James'	9⅛	6⅛	8⅛	2
South London	3 1/16	2⅛	3½	⅛
Westminster	8⅛	5⅞	7½	1⅛

Home Rails.

Stock or Share.	July 27th, 1914.	Dec. 31st, 1921.	Aug. 8th, 1922.	Rise.
Central Lon. Ass. Ord.	83	51½	68	16½
Metropolitan	37½	26½	49½	23
District	21⅛	21½	38	16½
Underground Ord. ...	2½	2	2⅜	⅛
ditto "A" ...	7s. 6d.	6s.	6s. 6d.	6d.
ditto Inc. ...	88	75½	82½	7

Cables, &c.

Stock or Share.	July 27th, 1914.	Dec. 31st, 1921.	Aug. 8th, 1922.	Rise.
Anglo-American Pref.	108½	84½	104	19½
Eastern Extension ...	12⅜	16½	18½	2
Eastern Telegraph ...	130½	166½	186½	20
Globe Telegraph Ord. ...	11½	16½	19½	2⅜
Great Northern ...	32½	26½	29	2½
Indo-European ...	59	27½	36½	9
Marconi	1 23/32	1 11/16	2⅛	9/16
United River Plate ...	6⅜	5⅜	7	1⅛
West India & Panama...	1½	¼	¼	—
Western Telegraph ...	13⅜	16½	19	2½

To draw precise comparisons in the cases of electrical manufacturing companies' shares is rendered difficult by

reason of various rearrangements of capital effected in most instances. The above tables are, however, as interesting as they are eminently satisfactory to investors. Rises are shown in every example save one, and the lists were compiled with no attempt to confine the record of movements to stocks and shares that have advanced. We have no space to set out the remarkable manner in which new issues of good stock, offered over the past seven months, have been eagerly subscribed, and how the issue prices are well below current quotations. The investor is to be congratulated upon the way in which his sound securities have increased in capital value.

The Home Railway market is once more in favour, owing to the welcome accorded by rising prices, to the publication of the terms of the North-Eastern Railway "group." Brazilian Tractions dipped to 49, and recovered to 50. Mexicans are still stagnant.

The Marconi dividend of 10 per cent., making 15 per cent. for the year—the same as that of a year ago—came as a pleasant disappointment, and the price rose from 42s. 6d. to 47s. 6d., reverting to 45s. Marconi Marines strengthened to 1 7/16, and the other members of the wireless group went a little better. Cable stocks are unchanged on the week. Bengal Telephone 7 per cent. scrip is harder at 3¼ premium. It is said that there may be more debenture stock of the Melbourne Electric Co. in the market before long. Holders of high interest-bearing debentures and notes should look into what possibilities there may be of having their securities repaid at an earlier date than they, the holders, anticipate. The rubber and armament markets are exceedingly quiet. A boomlet in South Africans is having a strengthening effect upon Victoria Falls ordinary and preference shares.

SHARE LIST OF ELECTRICAL COMPANIES.

Home Electricity Companies.

	Dividend 1920.	Dividend 1921.	Price Aug 8, 1922.	Rise or fall.	Yield p.c.
Brompton Ordinary	12	12	7¾	—	£8 0 0
Charing Cross Ordinary	8	9	7½	—	6 0 0
do. do. 4½ Pref.	4½	4½	4	+ ⅛	5 12 6
Chelsea	6	6	6	—	5 0 0
City of London	14	14	2⅛	—	6 18 0
do. do. 6 per cent. Pref.	6	6	22/6	—	5 6 8
County of London	8	8	1⅜	—	5 16 5
do. do. 6 per cent. Pref.	6	6	1⅛	+ 1/16	5 7 6
Kensington Ordinary	9	10	7⅛	—	7 0 7
London Electric	2½	4	2⅛	—	5 11 6
do. do. 6 per cent. Pref.	6	6	5	—	6 0 0
Metropolitan	7	7	5⅛	+ ⅛	6 7 6
do. 4½ per cent. Pref.	4½	4½	4	+ ⅛	5 12 6
St. James' and Pall Mall	12	12	8⅛	—	6 17 2
South London	7	7	3½	—	8 0 0
South Metropolitan Pref.	7	7	1 7/16	—	5 18 0
Westminster Ordinary	10	10	7⅛	+ ⅛	6 13 4

Telegraphs and Telephones.

Anglo-Am. Tel. Pref	6	6	104	—1	5 15 5
do. Def.	1½	84/6	23⅜	—	7 7 6
Chile Telephone	6	6	6	— ⅛	5 0 0
Cuba Sub. Ord.	7	7	8½	—	8 4 8
Eastern Extension	10	10	18½	—	5 8 1
Eastern Tel. Ord.	10	10	186½	—	5 7 3
Globe Tel. and T. Ord.	10	10	19⅛	—	5 4 7
do. do. Pref.	6	6	11⅛	—	5 6 8
Great Northern Tel.	24	22	29	—	7 11 8
Indo-European	10	10	36½	—	6 17 0
Marconi	25	15	2⅛	+ 1/16	6 18 4
Oriental Telephone Ord.	12	12	2⅜	—	*5 1 1
United R. Plate Tel.	8	8	7	—	*5 14 4
West India and Panama	Nil	Nil	5/-	—	Nil
Western Telegraph	10	10	19	+	*5 5 3

Home Rails.

Central London Ord. Assented	4	4	68	—¾	5 17 8
Metropolitan	1½	2⅛	49½	+1½	4 11 9
do District	Nil	1	38½	—	2 12 8
Underground Electric Ordinary	Nil	Nil	2⅜	—	Nil
do. do. "A"	Nil	Nil	6/6	—	Nil
do. do. Income	2	4	82½	—	*4 17 7

Foreign Trams, &c.

Anglo-Arg. Trams. First Pref.	5½	12½	8⅛	+ 1/16	7 17 2
do. do. 2nd Pref.	Nil	5½	3⅝	—	7 2 0
do. do. 5 per cent. Deb.	5	5	82	—	6 2 0
Brazil Tractions	Nil	Nil	50	—	8 0 0
British Columbia Elec. Rly. Pce.	5	5	76	—	6 10 9
do. do. Preferred	5	93/-	68½	—	*6 15 0
do. do. Deferred	3	124/-	74½	—	*8 5 10
do. do. Deb.	4½	4½	76	—2	5 11 0
Mexico Trams. 5 per cent. Bonds	Nil	Nil	7½	—	—
do. do. 6 per cent. Bonds	Nil	Nil	4½	+2	Nil
Mexican Light Common	Nil	Nil	21½	—	Nil
do. Pref.	Nil	Nil	51	—	Nil
do. 1st Bonds	Nil	5	66½	—2	7 10 9

Manufacturing Companies.

Babcock & Wilcox	15	16	8	—	5 6 8
British Aluminium Ord.	10	10	18/3	—	—
British Insulated Ord.	15	15	2⅛	— 1/32	7 1 2
Callenders	15	15	2⅛	—	7 1 2
do. 6% Pref.	6½	6½	1⅛	—	5 9 5
Crompton Ord.	10	5	15/-	—	6 13 4
Edison-Swan	10	Nil	3/3	—	Nil
do. do. 5 per cent. Deb.	5	5	64	—	7 16 4
Electric Construction	10	10	1⅛	—	8 0 0
English Electric	8	5	17/6	—	5 14 3
do. do. Pref.	6	6	18/9	—	6 8 0
Gen. Elec. Pref.	6½	6½	22/-	—	5 18 2
do. Ord.	10	5	18/9	—	5 6 8
Henley	15	15	2⅜	—	6 13 4
do. 4½ Pref.	4½	4½	4⅜	—	5 2 10
India-Rubber	10	—	1½	—	—
Met.-Vickers Pref.	8	8	2⅛	—	6 11 2
Siemens Ord.	10	10	27/-	+9d.	*7 8 2
Telegraph Con.	20	20	26	—	*4 12 2

* Dividends paid free of Income Tax.

MARKET QUOTATIONS.

It should be remembered, in making use of the figures appearing in the following list, that in some cases the prices are only general, and they may vary according to quantities and other circumstances.

Wednesday, August 9th.

CHEMICALS, &c.		Latest Price.	Fortnight's Inc. or Dec.
a Acid, Oxalic	per lb.	7¾d.	¼d. dec.
a Ammoniac, Sal	per ton	£63	...
a Ammonia, Muriate (large crystal)	"	£48	£4 dec.
a Bisulphide of Carbon	"	...	...
a Borax	"	£30	...
a Copper Sulphate	"	£26 10s.	10s. dec.
a Potash, Chlorate	per lb.	5d. to 5½d.	...
a " Perchlorate	"	7¾d.	...
a Shellac	per cwt.	£16 15s.	30s. dec.
a Sulphur, Sublimed Flowers	"	£11 10s.	10s. dec.
a " Lump	"	£11	...
a Soda, Chlorate	per lb.	3½d.	...
a " Crystals	per ton	£6	...
a Sodium Bichromate, casks	per lb.	5d.	¼d. dec.
METALS, &c.			
b Aluminium, Ingots	per ton	£120	...
b " Wire	per lb.	1/9 to 2/6	...
b " Sheet	"	1/6 to 2/-	...
p Babbitt's Metal and Anti-friction Metal—			
Grade I	per ton net	£150	...
Grade II	" "	£108	...
Grade III	" "	£62	...
c Brass (rolled metal 2" to 12" basis)	per lb.	9½d.	...
c " Tubes (solid drawn)	"	11¾d. to 1/-	...
c " Wire, basis	"	10½d.	¼d. inc.
c Copper Tubes (solid drawn)	"	1/1½	...
c " Bars (best selected)	per ton	£94	...
c " Sheet	"	£94	...
c " Rod	"	£94	...
d " (Electrolytic) Bars	"	£72	10s. inc.
d " Sheets	"	£145 10s.	...
d " Wire Rods	"	£82	10s inc.
d " H.C. Wire	per lb.	10⅞d.	...
f Ebonite Rod	"	3/6	...
f " Sheet	"	3/-	...
a German Silver Wire	"	2/6	...
h Gutta-percha, fine	"	12/6	...
h India-rubber, Para fine	"	9½d.	...
l Iron Pig (Cleveland Warrants)	per ton	90/-	...
l " Wire, galv. No. 8, P.O. qual.	"	£25	...
g Lead, English Pig	"	£26 10s.	10s. dec.
g Mercury	per bot.	£11 5s. to £12 10s.	...
e Mica (in original cases) small	per lb.	3d. to 8/-	...
e " " medium	"	4/- to 8/-	...
e " " large	"	10/- to 20/- & up.	...
p Phosphor Bronze, plain castings	"	1/1	...
p " drawn bars and rods	"	1/3	...
p " rolled strip & sheet	"	1/9½	...
p " wire	"	1/8½	...
o Platinum	per oz.	£19 10s.	...
d Silicium Bronze Wire	per lb.	1/1	...
r Steel, Magnet, in bars	"	1/-	...
n Tin, Block (English)	per ton	£162	£2 inc.
n " Wire, Nos. 1 to 16	per lb.	3/-	...

Quotations supplied by

a G. Boor & Co.
b The British Aluminium Co., Ltd.
c Thos. Bolton & Sons, Ltd.
d Frederick Smith & Co.
e F. Wiggins & Sons.
f India-Rubber, Gutta-Percha and Telegraph Works Co., Ltd.
g James & Shakespeare.
h Edward Till & Co.
l Bolling & Lowe.
l Richard Johnson & Nephew, Ltd.
n P. Ormiston & Sons.
o Johnson, Matthey & Co., Ltd.
p C. Clifford & Son, Ltd.
r W. F. Dennis & Co.

Telephone Removals.—In the telephone business every day is "moving day." During the past year one telephone out of every seven in the American Bell system was moved from one place of residence or business to another at some time during the year. The amount of material and labour and the extent of plant changes involved in "station movement" are indicated by the fact that this item of service cost the Bell system more than $15,000,000 in 1921. To most people the connecting or disconnecting of a telephone seems a simple operation of installing or removing the instrument. As a matter of fact, in every case it necessitates changes in the cables and wires overhead or underground. It also necessitates changes in central office wires and switchboard connections; in subscribers' accounts and directory listings; and frequently requires new "drop" lines from open wires or cables. The problems of "station movement" are among the large problems of the telephone service. Because of the double operation of disconnecting and re-connecting, the work involved is often twice as great as in the case of new subscribers. With 1,820,000 changes a year it is only by the most expert management of plant facilities that Bell service is enabled to follow the subscriber wherever he goes.

"Quick Repairs."—Siam has electricity and the thoughtful electric light people are doing their best. In every room in a Bangkok hotel is posted a notice in various languages. Its English version reads:—

"Sir: For the case that your electric light should fail, we beg to send you enclosed a postcard, which please send us at once when you find your light out. The company will then send you another postcard."—*American Legion Weekly.*

ELECTRIC LIGHTING IN THE NEAR EAST.

By E. J. HAWKINS.

A wide field is open in the Near East to the enterprising man to develop electric power schemes. The prospect of a handsome return on the capital invested is assured.

The Near East is gradually coming into line with the West in schemes for improvement, and among these is a growing demand for electricity. In the small towns in particular efforts are being made by the natives themselves to promote electrical undertakings, but these efforts are often abortive, because of the lack of intelligent methods. An electric lighting system properly undertaken and managed, that would meet the needs of small towns in Palestine, Turkey in Asia, Greece, and the islands of the Mediterranean and Ægian Seas, would specially prove a lucrative undertaking.

Where such schemes have failed, the failure has been due to insufficient capital and the lack of technical ability on the part of the native promoters—who have gone to work with insufficient knowledge. In scarcely one instance has there been a competent electrician in charge. A proper control of running costs and charges has not been set up. The plant is bought cheaply, with little regard for its capacity, and it is erected in the cheapest possible way. It is run by an indifferent staff badly paid. In a word, greed characterises the promoters. Efficient management, an exercise of discipline and supervision would turn failures into successes. A typical case has come under the writer's notice recently. An electric lighting plant in a certain town, financed by a number of Greek merchants and "controlled" by a so-called electrician, also a Greek, comprised a 4-cylinder Diesel (German make) engine direct-coupled to a d.c. generator. After several months' working, a big-end bearing gave out, resulting in the wrecking of the whole engine and damage to the extent of about £3,000. An examination showed that the break was due to lack of supervision and neglect of the oiling system.

The possibilities of well-conceived and properly-conducted schemes are immense. Many of the inhabitants of these small towns are enthusiastic about electric lighting. The opportunity awaits the enterprising man to take advantage of their enthusiasm and put forward an attractive scheme for the supply of electricity. A return of at least 20 per cent. net profit would result.

A scheme on the lines of what is suggested here is based upon the writer's experience in the Near East.

First, encourage the interest of the people in the proposed undertaking. An offer should be made to fix a complete lighting installation, say, up to ten lamps, free of charge in the houses of the first thirty applicants. Others would quickly follow. The average population of these small towns is about 12,000 inhabitants, of whom, perhaps, one-eighth would avail themselves of electric lighting. This would mean installations in about three hundred houses, each house having from ten to fifteen lamps. On an average one could assume 12.5 lamps of 20 watts each to every house, making a total of 250 watts per house, or 75 kilowatts for the whole. In practice, however, not more than 60 per cent. of the total installation for house lighting would be in use at any one time, so that plant capable of an output of less than 75 kilowatts would suffice. Probably house-lighting demands would be reduced to 45 kilowatts. Estimating the street lighting at five miles, with thirty-three 30-watt lamps to the mile, would make 4,950 watts, or a further five kilowatts charge on the plant. Therefore, a plant capable of delivering 50 kilowatts would meet the requirements of such a town.

In selecting an engine for such work, two points must be taken into consideration—climatic conditions and the native temperament; and the class of engine that meets these satisfactorily is the semi-Diesel crude oil engine. This engine can be operated easily by a person of limited intelligence and knowledge without much fear of a breakdown. In some localities water power could be employed. To drive a dynamo of 50 kilowatts output would require an engine of 70 b.h.p., but the most economical working would be obtained with a two-unit plant each unit of 35 b.h.p. and 25 kW running in parallel at times of heavy load. This would ensure the load factor and diversity factor of the station being relatively high.

With a two-unit plant and a steady lighting load a station battery would not be necessary, but this could be installed later should the demand for electricity increase. Normally the plant would be run from sunset to sunrise, but if any consumers could be induced to take energy for power purposes a day load might be arranged.

A number of these small duplicate plants might be erected in different towns—say five towns to one group—and the group put under the charge of a competent electrical engineer. His duty would be to visit the various stations and control and supervise the working of the whole system, the actual running being left to native electricians and mechanics. The Near East can produce some fairly competent craftsmen who, under the supervision of competent engineers, can be made to do good work.

The following figures show the probable expenditure and receipts from such a system:—

Capital Expenditure (for one station only)—	£
Acquisition of freehold of site	200
Two 35-h.p. semi-Diesel engines, direct-coupled to two 25-kW d.c. generators, at £1,180 each	2,360
Switchboard and switchgear	150
Building	750
Cable for mains ... ... (say)	1,500
Poles for above	750
Fittings for street lighting	125
Erecting charges, freight, insurance and incidentals	350
Meters	900
	£7,085

This gives the outlay for five stations—£35,425.

Annual Expenditure (for one station only)—	£
Crude oil, say 12,000 galls. per annum, at 9d. per gall. (in bulk)	450
Lubricating oil, say 1,000 galls. per annum, at 3s. per gall.	150
Sundries, renewals, &c.	100
Wages—	
1st electrician and mechanic, at £12 per month	144
2nd electrician and mechanic, at £6 per month	72
3rd electrician and mechanic, at £4 per month	48
Clerk, at £7 per month	48
Rates and taxes ... ... (say)	10
Stationery, postage, &c.	50
	£1,108

This gives a running expenditure for five stations—£5,540.

Earning Capacity (for one station only)—	£
House lighting consumption might be estimated at 48,000 kWh per annum, at 1¼ shillings per unit	3,200
Street lighting at 18,000 kWh per annum, at 6d. per unit	450
Rent of meters, at 1s. per month	180
	£3,830

This equals £19,150 for five stations.

Assuming that 10 per cent. depreciation is charged

against revenue on the capital outlay, then we should arrive at the following result:—

Trading Account.

	£		£
Annual expenditure over five stations ...	5,540	Yearly income from five stations ...	19,150
Salary and travelling expenses of engineer	1,100		
Depreciation ...	3,442		
Profit	9,068		
	£19,150		£19,150

Which shows a return of over 20 per cent. on a capital of, say, £40,000.

MINERAL SULPHIDES AS A SOURCE OF ELECTRIC ENERGY.

According to Mr. G. N. Libby in the *Engineering and Mining Journal*, of April 22nd, 1922, laboratory experiments show that a cell of the Bunsen type can be used with iron pyrite as an anode in an alkaline solution, and the possibility of economy over existing methods of generating power is suggested. The following is a summary of the chief points of the article:—

It has been known for some time that mineral sulphides may function, both as soluble and insoluble electrodes, in electrolytic cells. The fact that they may be a source of electric energy of commercial value is not so well known. The heat of oxidation of carbon and sulphur and some mineral sulphides is given in the following table:—

	Calories, per kg.	Electrical Equiv. kWh per kg.
Carbon to carbon dioxide	8,600	9.55
Sulphur to sulphur trioxide ...	4,410	5.10
Iron pyrite to ferrous sulphate and sulphuric acid	2,930	3.40
Zinc sulphide to zinc sulphate ...	2,345	2.73
Galena to lead sulphate	815	0.94

It will be noted that weight for weight at maximum oxidation sulphur has about half the heat of carbon, and that the electrical equivalent of this heat is 5.1 kW-hr. per kilo. of sulphur. But sulphur as such is too poor a conductor, and it is only when combined with metals, such as copper, iron, or lead, that it becomes a readily oxidisable substance as an electrode. Amongst these mineral sulphides galena is the best conductor, but its high molecular weight makes the heat of oxidation of an equal mass only equivalent in energy value to one quarter of its weight in pyrite, which, in turn, yields about one-third of that of an equal weight of carbon. Carbon burned under a boiler yields about one-third of its energy as electricity.

If the heat of oxidation of pyrite can be changed directly into electric energy, then it is practically equal to carbon as a source of that energy. While data of the power-house cost of changing the heat energy of coal into electricity are available, no such data exist for the operation of cells of the type and size that the operation of obtaining power from oxidation demands. However, in the cyanide metallurgy of gold extraction on a large scale the cost of agitation, filtration, handling, &c., such as would also be necessary in electrolytic cell operation, is not more than 70 cents. per ton at the Homestake Mine. But it must be remembered that large quantities of copper pyrites are daily oxidised in metallurgical plant, the gaseous products of which are often discharged into the atmosphere, and not infrequently cause material damage. The cost of oxidation, which is usually a roasting operation, credited against any system of producing equivalent results for recovering the copper from the ore must be taken into account.

Comparison with coal is scarcely admissible; in pyrites we have a substance that is practically a waste product, which is mined and delivered, and which must be oxidised by some method as a necessary part of the extraction of the valuable associated metal. In the Butte district of Montana about 4,000 tons of copper pyrite is oxidised daily in the production of copper. The energy capable of being generated by this pyrite, if there were no loss, is equal to

3,490 x 4,000 = 13,960,000 kWh;
13,960,000/24 = 580,000 continuous kW.

If compared with the best coal-burning practice, this is worth

580,000 x $20 = $1,600,000 per year;
11,600,000/365 = $31,600 per day;
31,600/4,000 = $7.90 per ton of copper pyrite.

The proportion of this value that would be realised would depend on cell efficiency, which might be anything from 50 to 90 per cent. Power from cell oxidation of sulphides could not, any more than coal, compete with cheap water power, but the value of water power is, nevertheless, estimated at its cost in competition with coal. The oxidation of mineral sulphides in cells is found to proceed rapidly in alkaline solution, the mineral acting, in fact, similarly to metallic zinc in an alkaline solution, but with a lower e.m.f.

Nitric acid is an efficient depolariser, producing by the cell action NO_2, which is readily oxidised again to HNO_3, so that, theoretically, by proper oxidation and absorption of the gases from a cell of the Bunsen type nearly all the acid could be regenerated for repeated use. A modification of a cell of this type may consist of a tall 300 c.c. beaker in which is placed a smaller 200 c.c. beaker. Into the small inner beaker is poured enough mercury to cover the bottom about a quarter-inch deep. An insulating layer of chloroform of about the same volume is added and a piece of pyrite about one inch cube placed in the beaker, making good contact with the mercury. On this a strong solution of alkali is poured to nearly fill the beaker. Strong nitric acid is put in the outer beaker, enough to make the liquids in the two beakers equal in height, and the two solutions are connected with about 30 quarter-inch asbestos wicks. A platinum wire serves as the acid electrode, but other substances might be used. A copper wire protected by a glass tube and inserted into the mercury gives connection with the pyrite.

This cell, on closing, gives 1.15 volts and 0.3 amp. with no diminution of current until ferric hydrate resulting from the action forms in sufficient quantity to create a resistance. The ability of pyrite to depolarise or oxidise in an alkaline solution can be shown in such a system by sending through a current of 2 amps. with a pyrite anode surface of two square inches, when little or no evolution of oxygen is observed. The current taken from such a cell depends upon the internal resistance, which is due principally to the asbestos wick diaphragm and the electrode coating. Ferric hydrate is soluble in sodium potassium tartrate and other organic substances, and if one of these is added to the anode solution it keeps ferric hydrate from coating the anode. The cell, in principle, is only an adaptation of a well-known form of cell of the Bunsen type, but the use of a mineral sulphide as an oxidising electrode in such a combination is believed to be new. The reaction of the cathode in the nitric acid compartment is fairly well established.

At the anode, however, two reactions occur: first, the oxidation of the sulphide to sulphate, then the reaction between the sulphate and the alkali with the formation of ferric hydrate. Consequently alkali, as well as sulphide, is consumed. To replace, say, caustic soda would be economically impossible, but lime (calcium hydrate) is cheap and abundant. This could be used directly in the cell, which might involve calcium sulphate incrustations, which would produce insulation. In that event an indirect method probably could be developed. The design of the laboratory cell described cannot, of course, be adopted on a large scale. It merely serves to demonstrate the fact that the oxidation of mineral sulphides yields electric energy. But a suitable cell could be devised without great difficulty for large-scale operation. Pyrite has twice the value of an equal weight of zinc, and the energy generated by the oxidation of the sulphur of the sulphide is much more than enough to precipitate its metal from the sulphate formed. It may be possible to oxidise the sulphide in one cell generating electricity, and in another cell to use this energy to electroplate the metal from the solution resulting from the action in the first cell. The reason for this excess energy oxidation over that needed to deposit the metal is evident when it is realised that the complete oxidation of pyrite requires seven atoms of oxygen, whereas reduction of ferrous oxide requires that one atom only of oxygen be taken away.

The conclusions set out above may be summarised briefly as follows:—

(1) Certain mineral sulphides are a possible source of electrical energy.

(2) Pyrite seems particularly promising for this purpose, especially in view of the fact that it is now oxidised metallurgically in enormous quantities with waste of the volatile products.

(3) A simple laboratory cell has been described which demonstrates the possibility of oxidising mineral sulphides with the production of electrical energy.

(4) The new fact demonstrated appears to be that mineral sulphides, such as pyrite, oxidise readily as an anode in an alkaline solution.

Association of Mining Electrical Engineers.—On July 29th members of the Midland Branch of the Association paid a visit to the works of the Brush Electrical Engineering Co., Ltd., Loughborough. The visitors inspected the various processes in the manufacture of Brush-Ljungström turbines and generators, and the transformer and winding departments were also visited. Another department which proved of interest was the rolling-stock works, where cars ordered by numerous authorities in all parts of the world were seen in various stages of construction. Tea was provided by the directors of the firm, who were thanked for their hospitality. The visit concluded with the monthly general meeting of the branch at which the retiring officers were re-elected.

NORWAY'S ELECTRIC POWER PROGRAMME.

From the report on economic conditions in Norway, which has recently been issued by the Department of Overseas Trade, it is apparent that that country has yet to recover further before she can offer many opportunities to the British exporter. The Commercial Secretary at Christiania (Mr. Paus) says, however, that much has been done to clear the ground. Although stocks of goods, which can only be realised at a loss, still remain, large quantities have been disposed of during the past twelve months with corresponding relief to credit. In the demand for certain of Norway's staple export products there are signs of temporary improvement. This tendency will be more marked as business in Great Britain becomes better, but no complete recovery in Norway is considered possible until conditions in Germany and Russia grow more normal. Of more immediate interest are those portions of Mr. Paus's report which deal with electrical progress, particularly in connection with the utilisation of water power. The Commission appointed by the Storting in 1918 to inquire into the question of a scheme for the supply of power over the whole of Norway has now concluded its preparatory work, and proposals have been formulated for satisfying the requirements of practically the whole country in respect of energy for lighting and domestic purposes, and for the use of farmers, craftsmen, and small industries, on the basis of 250 watts per individual. It is estimated that, without including the cost of supplies already available, it will be necessary to expend a further sum of kr. 300,000,000 to this end. It is apparently intended to suggest that the public authorities of each county shall in the main be made responsible for, and shall be given the necessary powers to undertake the provision and distribution of electrical energy within the county in so far as the smaller towns and country municipalities are concerned, while the larger towns will be required to organise their own supply, as, in fact, they have already done.

Overdue Distribution Work.

During and immediately after the war a large number of schemes were initiated by various municipalities with a view to providing electrical energy for domestic and agricultural consumption and for the use of minor industrial concerns, and many waterfalls were harnessed to this end. Arrangements for the distribution of the power which has thus become available are now being made. In view of the prevailing industrial depression and the fact that new supplies of energy are required only for domestic service, it is generally felt that power already harnessed will satisfy the demand for the next few years, unless the electro-chemical and electro-metallurgical industry should receive some at present unforeseen impetus. It has been arranged that the municipalities of Christiania and Drammen shall receive from the Rjukan power station 12,500 kW and 2,500 kW respectively, while the Buskerud county is to receive 4,000 kW from the same source. The scheme for extending the Labro power station with a view to the delivery of an additional 3,600 kW to the Drammen municipality has, therefore, been suspended for the present. The Norwegian Government will undertake the construction of the transmission line from Rjukan to Kongsberg, while the Buskerud county and the municipalities of Christiania and Drammen will undertake the transmission for the remaining distances. The construction of this transmission line was commenced in the spring of 1921, and it is expected that the power will become available in October, 1922.

Operations are being continued in connection with the power scheme at Nore where the tunnel and catchment basin are in process of construction and the site for the pipe line is under preparation. A grant of kr. 4,500,000 has this year been made to the scheme. Work is also proceeding on the railway from Kongsberg to Nore, upon which kr. 4,500,000 has now been expended.

Work upon the Hakavik installation, which is to supply power to the Christiania-Drammen railway, is nearing completion, and it is now hoped that electric traffic will soon commence between Christiania and Sandviken or Asker. It will be necessary, however, to construct a new bridge over the Drammen river before the whole journey can be made by electric train, as the existing bridge is not strong enough to carry the heavy electric locomotives.

At Glomfjord, in the Nordland county, 50,000 h.p. has been installed and the installation of an extra pipe line for 27,000 h.p., together with the necessary electrical equipment, is nearing completion. The State is prepared to consider proposals for the application of this power. A zinc-smelting works controlled by Swedish interests, which has rented 50,000 h.p. from this source, has experienced difficulty in fulfilling its contract, and the State has hitherto received no return for the large capital invested in the power station.

The harnessing of Solbergfos on the River Glommen has been continued and is expected to be completed in 1924. Of the power obtained from this scheme, which has been estimated at 50,000 h.p., one-third will be taken by the municipality of Christiania, and two-thirds by the State.

Municipal Power Schemes.

The harnessing of the Raanaasfos on the River Glommen is nearing completion, and it is expected that the Christiania Municipality will take delivery of 12,000 kW from this source about the end of the present year. The offer of power to Christiania from Tysse has not been accepted.

The Bergen Peninsula Power Co., an amalgamation of the Bergen Municipality and a number of small municipalities in the Bergen district, is considering the construction of a 100,000-h.p. station at Dale with a view to the delivery of energy to the members of the company. The scheme of the Bergen Municipality to procure 6,000 kW from Herlandsfos has, therefore, been suspended.

The harnessing of the Höge waterfalls, owned by the Aust Adger county, has now been completed.

Work has continued on the following schemes:—

That of Nord Tröndelag county for harnessing the Folla watercourse. It is expected that the delivery of power will commence in about a year's time. The scheme for the harnessing of the Tafjord watercourse in the Romsdal county. The scheme of the town of Kristiansand S. for the harnessing of the Nomeland fall. That of the town of Fredrikshald for power stations on the Brekke and Krappeto waterfalls.

The Troms county has initiated a scheme to procure 2,000 h.p. from the Bardo waterfall.

State Aid.

On February 23rd, 1921, the Norwegian Ministry of Finance concluded with a syndicate of Norwegian banks a loan of kr. 50,000,000 to be devoted to assisting various municipalities in completing power schemes which had been interrupted owing to financial difficulties. From this fund advances have been made of kr. 6,000,000 to the Aust Agder Municipality, kr. 14,000,000 to the Tafjord Power Co., and kr. 9,000,000 to the Nord Tröndelag County in aid of schemes mentioned above. A number of other municipalities have also received assistance.

Export of Hydro-Electrical Power.

The commission consisting of members appointed by the Norwegian, Swedish, and Danish Governments to consider the possibility of transmitting electrical power from Norway to Denmark has continued its deliberations. Norwegian experts are of opinion that the scheme will eventually be realised, although financial and technical difficulties have first to be overcome. It is expected that by the end of 1924, which is considered the earliest date at which the transmission line could be completed, Norway will be in possession of a considerable surplus of power available for export. The question whether the power should be carried overland through Sweden or by a submarine cable direct to Denmark remains unsettled, but the former alternative seems to be regarded with most favour.

German Competition.

The Commercial Secretary does not take a hopeful view of the immediate prospects of selling British electrical goods in Norway. Owing to the depreciation of the mark, he says, German manufacturers dominated the Norwegian market during 1921 for all kinds of electrical machinery and cables. British, American, Swedish, and Swiss firms, therefore, experienced great difficulty in doing business. For the same reason Norwegian factories secured a very small portion of the trade; they were working at only about half their capacity and sold at prices which probably entailed a loss.

Owing to the prevailing general depression, and particularly that of the electro-chemical industry, the demand for new supplies for industrial purposes is very small. It is anticipated, however, that 1922 will see a fair demand for small transformers and motors and for cooking and heating apparatus in connection with the realisation of municipal power schemes. It has not hitherto been found that the fall in the price of coal has affected the demand for electrical cooking and heating appliances.

At the present moment German manufacturers are doing a good trade, and it is expected that they will continue to secure the bulk of the business unless the mark recovers in value.

Insulated Wires for Greece.—The U.S. Consul at Saloniki, Greece, in a recent report on Saloniki as a market for rubber goods says that, as a result of the intensive reconstruction of the burned zone of the city, large quantities of rubber insulated wire will be required. High-pressure insulated wire for telephone and telegraph installations is not demanded from the local market, as these services are Government owned and Government supplies are contracted for at Athens. The light and power plant at Saloniki supplies 220-volt energy for light and 440 and 550-volt energy for power. For the general market Italian and English insulated wire is imported at present. German prices are said to be competitive, but stocks for prompt delivery are not available in Germany.

AUTOMATIC TRAIN CONTROL.

The following is a brief summary of the report of the Automatic Train Control Committee appointed by the Minister of Transport under the chairmanship of Col. J. W. Pringle, C.B.*

The word "control" is construed in its widest sense to include not only cab- and fog-signalling devices, but also more direct methods, such as the automatic application of the continuous brake and the regulation of motive power, speed, &c. The main points for consideration were: (*a*) the technical, climatic, and physical conditions governing railway traffic in this country, which might render special treatment necessary; (*b*) the degree of safety existing and the extent to which additional security was desirable and attainable; (*c*) the methods of automatic control which appeared most suitable; and (*d*) he cost of installation. Evidence was given by responsible traffic and outdoor locomotive officers of the principal railway companies; accident statistics were reviewed and analysed; an inspection was made of a number of existing automatic control systems; and estimates were obtained from railway companies and inventors of the cost of installing various systems of control. A sub-committee examined about 200 inventions, which included mechanical, electrical, and electro-mechanical devices of all known types. All control devices can be classed under two main heads, indirect and direct. The indirect type automatically provides, either on the train or the track, visual and audible indications, supplementary to those given by the wayside signals. In this type reliance is still placed upon the driver. With the other class it is arranged that either the power brake is applied automatically, or that the speed is controlled by means of a brake which can only be released when the speed has fallen to a predetermined limit. Automatic train control can also, generally, be divided into two main types—continuous and localised, or intermittent. A continuous type of control aims at protecting a train constantly throughout its journey, and devices of this kind are essentially electrical, and usually, though not invariably, of the non-contact type so far as the control mechanism is concerned. They are dependent upon complete track-circuiting or its equivalent. There are several arguments against this form of control; for instance, the first cost; the cost and difficulty of supplying electricity to all railways in such a form as to be adaptable to a standard system of control; costly maintenance; it would mean scrapping the highly-developed systems now existing; and risk of failure of electrical supply. In the light of these disadvantages the Committee is of opinion that expenditure to the extent necessary for continuous control is not justifiable upon surface lines in Great Britain. Such control might, however, be provided on an entirely new line. The committee's attention was therefore directed to localised control, which would supplement, rather than supplant, existing signalling and block telegraph systems. Localised control can be either of the "non-contact" or "contact" type. Although the former type avoids physical contact between track and locomotive apparatus, it is more complicated, entails a considerable addition to the maintenance staff, and is more expensive in first cost and upkeep than the contact type. The latter form of control is best known and most developed, and despite the disadvantage of the shock effect, the apparatus has proved reliable after many years' operation. Three indications can readily be provided, *viz.*, "clear," "warning," and "danger," and alternative methods for obtaining brake release can be obtained. In conjunction with local track-circuiting this type of control can be used with automatic and three-position signalling. Moreover, as track-circuiting is extended the control exercised by any localised device, although not strictly continuous in character, will confer nearly all the benefits obtainable from a continuous system. The employment of "speed control" and "time element relay" devices is not considered by the Committee to be advisable. The Committee also thinks that no form of control would tend to lessen the number of buffer-stop collisions. An analysis of 193 typical cases of accidents showed that those due to signalmen's errors amounted to 25.4 per cent., and those mainly caused by failure of enginemen formed 36.8. These might be considerably reduced by track-circuiting, electrical control of signals, and some form of automatic train control. The Committee agrees that sufficient provision for safety against preventable train accidents could not be made without recourse to train-control at distant signals also. As a general rule it is considered that this should provide distinctive effects for both "clear" and "warning" positions in order adequately to meet fog-signalling requirements. The Committee has formulated a set of "Requisites" with which control systems should comply. In compiling these due regard was paid to standardisation, future development, and cost. They provide, *inter alia*, that the "danger" effect shall be produced at a two- or three-position stop signal when this indicates, or should indicate "danger," and shall consist of a full application of the power brake. The "warning" effect shall be produced whenever the signals indicate "caution," and shall consist of an unmistakable brake application and audible warning. The "clear" effect shall be produced when the signals correctly give the "clear" indication, and shall consist of a distinctive audible signal. The apparatus shall be so constructed that the correct position of all track and train elements is assured under all conditions, and shall be capable of operating under all conditions which permit of traffic movements. In the event of failure of the mechanism the device shall assume the "danger" or "warning" positions and give the corresponding indications. In the opinion of the Committee the most suitable position for the track element of train control at distant signals is the centre of the four-foot way. Special mention is made in the report of the procedure to be followed in the cases of banking engines, double-headed trains, or two trains coupled together. The effect of the extension of electrification upon the use of a fixed electrified ramp will require special consideration, and special precautions may be necessary to safeguard against false "clear" effects being given as the result of a ramp becoming energised from an extraneous source. In an appendix (III) to the report details of costs are given. It is shown that the first cost would be as follows: Control at stop signals, £1,295,000; control at distant signals, £3,365,000. Annual charges for maintenance and renewals: Stop signals, £105,750; distant signals, £301,250. Full scheme: First cost, £4,660,000; annual charges, £407,000. Against this may be placed an annual saving of £100,000 on account of the displacement of fog-signalling, apart from the saving consequent upon a reduction of accidents. Finally, the Committee recommends a start in the direction of automatic control by the introduction of a system at selected "stop" signals; and also the formation of a committee of experts to determine and standardise track and locomotive apparatus.

*H.M. Stationery Office. Price 9d. net.

MERZ-PRICE 66,000-V PROTECTIVE GEAR WITH BEARD-HUNTER COMPENSATED PILOT.

It is interesting to note the great importance which has been attached to an efficient method of protection for the high-pressure cables which have recently been installed in and around Paris. At the new power station at Gennevilliers (described in our issues of April 14th and July 21st) the current is distributed at 60,000 volts to the surrounding sub-stations, several kilometres distant. The cables are run in duplicate, and in view of their importance with respect to continuity of supply the protective apparatus must be sensitive to small fault currents, absolutely discriminative, and must possess maximum stability.

These factors have been realised by the engineers who have designed this large power scheme in France, and Messrs. A. Reyrolle & Co. have recently completed the Merz-Price protective apparatus for the high-pressure cables. The problem of design presented greater difficulties than in previous cases,

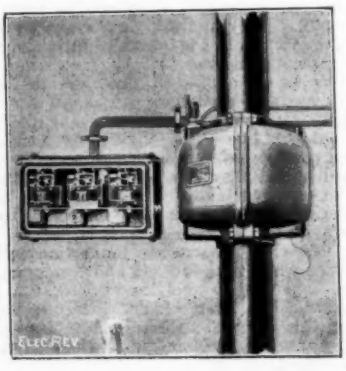


Fig. 1.—56,000-V Merz-Price Transformer and Relay.

since more sensitive operation was required than had hitherto been necessary; at the same time, the apparatus was required to be perfectly stable when heavy "through" currents were passing. These requirements have been made simpler by the use of the compensated pilot, in which the capacity current in the pilot is rendered ineffective. Improvements also in the manufacture of the balancing transformers have assisted in obtaining the necessary stability. The transformers are of such dimensions that efficient protection can be given for feeders of 50 miles or more in length, and tests were made at the makers' works for balance between the transformers with a current greatly in excess of that likely to be met with under short-circuit conditions.

The photographs show the Merz-Price transformer and relay (fig. 1), and the installation in the switch-house at the Gennevilliers power station (fig. 2). The sensitive relay controls the large circuit breakers near by. It will be noted that the

transformers are enclosed in metal cases, and they are constructed in a thorough and robust manner.

Experience has already been obtained with this apparatus under fault conditions, and in each case the damage has been negligible consisting of a small burn through the insulation

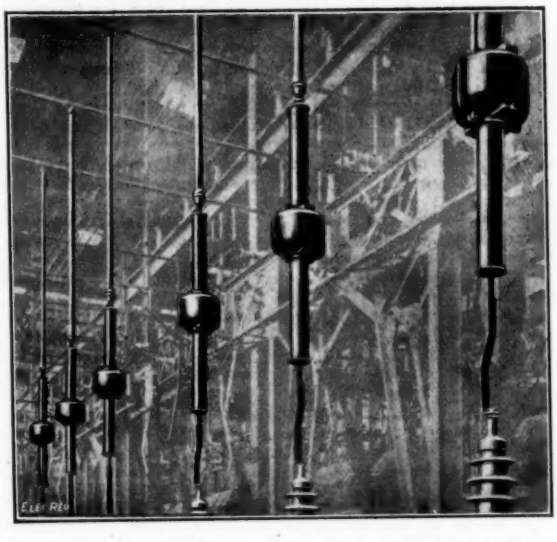


Fig. 2.—Cable Protective Apparatus in the Gennevilliers Station.

of the cable. The damage was very easily and quickly repaired, and the feeder recommissioned within a few hours of the breakdown.

THE MANUFACTURE OF ELECTROLYTIC IRON.

In *Chemical and Metallurgical Engineering*, of April 5th, 1922, Mr. G. F. Macmahon gives details of a process for the manufacture of electrolytic iron. The essential points of the article are given below:—

Electrolytic iron deposited from an ammonium sulphate-chloride-ferrous sulphate solution is suitable as a substitute for certain grades of sheet iron and iron wire in various types of electrical equipment. Until recently the high cost of electrolytic iron prevented its use commercially, but the process operated at Grenoble, in France, by which boiler tubes are made by the employment of a ferrous chloride electrolyte and the Eustis process, also a chloride one, seem both likely to prove commercially sound. These processes aim at the production of a ductile and malleable product, but the process now to be described is directed to the production of a brittle deposit, which can be readily pulverised.

The principles of an electrolytic refining unit are the same for iron as in a copper, zinc, or lead refinery, the tanks being connected electrically in series-parallel. Unlined wooden tanks 3 ft. wide, 10 ft. long, and 4 ft. deep are built and assembled on piers well above the basement floor. A neutral, or nearly neutral, electrolyte is employed, and lead piping for the conveyance of the liquors gives the best service. The electrolyte requires frequent filtering to prevent the impurities accumulating. The rate of flow through the tanks is about three gallons per minute, and the overflow is taken to a tank, mixed with diatomaceous earth, and filtered before being returned to the depositing tanks. The purpose of the addition of siliceous material is to facilitate the formation of porous filter cakes. The electrodes are lifted from the tanks by an overhead crane with a lifting capacity of 4 tons. Current is supplied from a generator, 3,300 amps., at about 36 volts. For a high-grade product the anodes must be fairly pure, and Bessemer, or open-hearth, steel is usually the material. The anodes are cast 3 ft. 8 in. x 3 ft. 5 in. x 2 in. over all; lugs are approximately 1 in. thick. Sixteen anodes per tank is the usual number, and these are spaced at 7.5 in. centres. Closer spacing is not satisfactory, as it tends to produce "treeing."

Cathode starting sheets are of $\frac{3}{8}$ in. x 2 ft. 6 in. x 3 ft. 8 in. cold-rolled steel, and are riveted to hard-drawn copper bars $\frac{1}{4}$ in. x 1 in. x 41 in. long. To key the deposit to the steel blanks $\frac{3}{4}$-in. holes are drilled about 6 in. apart near the solution line. The deposited metal practically fills these holes and holds the deposit to the blank sheet. Fifteen cathodes are used per tank. The sheets are pickled before use in dilute sulphuric acid, washed with hot water, and coated with kerosene. After about 12 or 13 days the deposit of electrolytic iron has reached a thickness of about a quarter of an inch, and is withdrawn from the tank and stripped off. The approximate composition in percentages is as follows:—

Carbon	0.014	Sulphur	0.003
Phosphorus ...	0.013	Manganese ...	0.029
Silicon	0.028		

"Treeing" on the cathodes depends upon the composition of the electrolyte, but the addition of a trace of glue to the bath is a good preventive of "treeing." The electrolyte which has been found to be most satisfactory has the following composition:—

Iron	60 grammes to the litre.
Chlorine	25 grammes to the litre.
Ammonia	25 grammes to the litre.

The successful deposition of iron depends upon this composition being maintained practically constant. At first the electrolyte has a slight acid reaction, but after being in use a short time it develops alkalinity, which must be corrected by careful additions of acid. The desired condition of the electrolyte is either absolute neutrality, or the slightest alkalinity, as the iron product is, under such conditions, the most satisfactory. The conductivity of the electrolyte is increased by warming it to about 45 deg. C., at which temperature, or near it, the electrolyte remains so long as the current is passing.

The loss of electrolyte constituents is practically nil other than the unavoidable small waste in working. Iron tends to concentrate in the solution, due to the additions of acid, and this must be corrected by dilution from time to time. The consumption of acid in the counteraction of alkalinity is quite small, and adds but little to the operating costs. A current density of between 12 and 15 amps. per sq. ft. of immersed cathode produces good results, and the yield of deposited iron is about 90 per cent. of the theoretical; 3,300 amps. is used for each tank at 1.3 volts, and the average output per kilowatt hour is about 1.5 lb. of refined iron.

The essential points to observe to obtain satisfactory results are: (1) the use of a small amount of glue in the electrolyte; (2) efficient circulation of the electrolyte to avoid stratification and re-solution; (3) proper ammonia concentration; (4) avoiding high ferrous sulphate concentration, which produces a tendency to "treeing"; (5) a fairly high, but not too great, chlorine concentration; (6) a suitable temperature, which influences the hardness and permeability of the deposit.

Iron deposited at 59 deg. C., or over, is softer and less brittle than that deposited at 25 deg., other conditions being the same.

If electrolytic iron be deposited at different temperatures under the same conditions with respect to current density and composition of the electrolyte, its magnetic permeability is almost directly proportional to the temperature of the electrolyte between the limits of 25 and 50 deg. C. This variation in the permeability of freshly prepared electrolytic iron has been known for some time, but the cause of such variation from an electro-deposition point of view, had not been ascertained. It now seems that the rate of annealing and the permeability obtained are dependent upon the electrolytic baths and the changes occurring therein.

WIRELESS TELEPHONY.

Radio Research Board's Report.

It will be remembered that in October, 1921, the Radio Research Board of the Department of Scientific and Industrial Research appointed Sub-Committee E (radio telephony), consisting of Admiral of the Fleet Sir H. B. Jackson (chairman), Prof. C. L. Fortescue, Prof. G. W. O. Howe, Major A. G. Lee,* and Mr. O. F. Brown (secretary), as the result of a resolution that was passed by the Imperial Conference, to examine the present position of wireless telephony in this country, and in doing so the Committee had the assistance of witnesses representing the three fighting services, Marconi's Wireless Telegraph Co., Ltd., and the Radio Communication Co., Ltd.

In its report, which was issued last week,† it states that for the transmission of a specific message over any distance—long or short—the radio telephone is greatly inferior to the radio telegraph in accuracy, speed, and cost; and is likely to remain so. The articulation of the best radio telephone installations compares favourably with that over a trunk land line, but it is necessary to repeat or spell unusual words or proper names and repeat figures. The skilled personnel necessary to work a large radio telephone installation

* Major A. G. Lee (G.P.O.) had to go to India in connection with the Imperial Wireless Chain during a part of the time that the Committee was sitting, and his place was taken during his absence by Mr. E. H. Shaughnessy, the P.O. representative on the Radio Research Board.

† H.M. Stationery Office, Cornwall House, Stamford Street, S.E.1; Cmd. 1707. Price 3d. net.

or a number of small ones is approximately that necessary to maintain similar radio telegraph stations. The spheres of utility of the two systems are as separate and clearly defined as those of land line telephony and telegraphy.

Considerations of mutual interference—quite irrespective of the greater convenience of land lines—rule out the radio telephone for local connections. Therefore, the most important applications of the radio telephone on a commercial scale are as a connecting link between ordinary land-line telephone systems either at great distances (*e.g.*, between Europe and America), or at medium or short distances as a means of communication with isolated posts where the laying of a telephone cable would be expensive or impracticable; or again, broadcasting intelligence and music for the general benefit of the community is a further example of its commercial utility. There are occasions, also, usually in the case of very short distances, when personal communication between principals is essential and secrecy is unimportant. In these cases the use of a radio telephone, even independent of land line systems, may be very convenient. The fighting services have directed their development of radio telephony almost entirely to meet such demands, and have developed efficient non-secret installations suitable for their special requirements; for example, the Air Force makes use of radio telephony daily in the navigation and landing of aircraft; and it has been developed to a certain extent in the Navy for communication between particular officers of ships in close company. The need for similar communication may also arise commercially; for example, when a ship is approaching harbour, direct communication between the master and the port authorities with regard to berthing and other matters might effect a considerable saving of time in getting alongside.

The requirements of any system of telephony for commercial success may be summarised as follows:—

(*a*) The articulation must be reasonably good.

(*b*) It must be possible for subscribers to be connected—either during the whole day or specified periods—without excessive delay.

(*c*) The running and maintenance costs must be such that without excessive charges the Service can pay its way.

(*d*) Some degree of secrecy must be provided.

The interference of atmospherics is very variable both in respect of locality and season, and in certain localities communication may be interrupted from this cause for hours or days, even when very high transmitting powers are used. As regards (*d*) a service might be considered commercially possible if the interception of a conversation required costly and elaborate apparatus needing skilled adjustment, thereby making interception a matter of great difficulty and impossible with ordinary radio telegraph receiving instruments. Furthermore, where the radio telephone is a link between land line systems it must provide for direct connection so that two subscribers may be able to communicate from the telephone installations in their own homes or offices without having to travel to special radio stations to carry on their conversation.

With regard to long distances (3,000 miles and over) it appears that, under those favourable conditions which are experienced for a few hours daily in most places, it is technically possible for speech to be transmitted through the ether to any range up to the distances which are now judged feasible for reasonable radio telegraph communication, provided expense is no object and secrecy is immaterial. Demonstrations have been given of the transfer of speech by non-secret methods over distances up to 2,000 miles or more. However, no organised experimental work with a view to providing a reasonably secret commercial service over such distances is contemplated in this country. The possibility of establishing satisfactory radio telephone communication on a commercial basis over a distance of 3,000 miles or more is remote. The reasons for this conclusion may be stated as follows:—

(*a*) The wave lengths most suitable for long-distance radio telegraphy are unsuitable with the methods at present in use for radio telephony, and telephonic communication would, therefore, have to take place on wave-lengths which are known to be inefficient for long ranges.

(*b*) The power required for radio telegraphic communication for a 24-hour service daily is already very large, and in spite of the improvement in receiving apparatus modern practice favours the use of higher powers for long distance communication than were considered adequate a few years ago.

The powers for radio telephone services are estimated to be from 3 to 20 times greater than those at present considered necessary for similar radio telegraph services over the same ranges. The necessary charge for a conversation would accordingly reach an impracticable figure.

(*c*) No appreciable secrecy can at present be obtained for a conversation taking place at such a range.

(*d*) The interference with other radio communication would be greater than that due to two radio telegraph stations communicating over the same distance on the continuous-wave system, owing largely to the increased power.

(*e*) Radio telephone communication would be exposed to atmospheric interference, and the interference of other radio stations, to a greater extent than radio telegraph communication over the same distance. With a long distance radio telegraphic service it is possible in the event of temporary adverse conditions to hold back traffic without serious results, but with long-distance radio telephony, a delay through any disturbance would be most detrimental to the service.

For medium ranges, say, 1,000 miles, the difficulties as regards a commercial service are practically the same as those for longer distances, except for the fact that unless considerations of mutual interference prevailed, the waves which could be used for radio telephony would be the same as those which are efficiently used for radio telegraphy. However, in remote localities where the danger of mutual interference between radio stations is small and the risk of interception of the conversations by unauthorised persons is slight a radio telephone service employing waves of the length used by medium power radio telegraph stations would be possible; provided always that the cost of the necessary additional power was not prohibitive.

The position as regards short-distance communication, 200 miles and under, is, however, more hopeful. The Marconi Co. in this country is experimenting with semi-secret systems with the expectation of placing radio telephony on a commercial basis in the near future for distances up to about 200 miles over sea. The representatives of the Marconi Co. have furnished the Committee with a complete description of the installations intended for such a service between this country and the Continent, using short wave lengths of the order of 100 metres and a power of 5 kW. This company has informed the Committee also of the very promising results of experiments at a range of 90 miles over land using wave lengths of the order of 20 metres. Although this later line of development appears promising, it must be recognised that the system proposed is only in the experimental stage. Neither of the systems has yet been tested in an actual commercial service.

The conditions requisite for a commercial service as enumerated above, can be met at the present time in the case of a service over a short range to the following extent:—

(*a*) The articulation is approximately as good as on land lines of similar length.

(*b*) It seems probable that a full 24-hour service could be maintained in most localities.

(*c*) Atmospheric disturbances and, under present conditions, interference by and with other stations are very much less troublesome on the short waves used, so that delays of traffic through these causes are less probable, and the power required is not excessive.

(*d*) Unauthorised reception is made more difficult by the use of short waves, but the conversations can be picked up by special apparatus. In the case of very short waves, instruments of very special design are required and, moreover, transmission can be made to some extent directive, *i.e.*, the waves can be made stronger at points on the line joining the transmitter and receiver than at points off that line, thus reducing the area over which interception is possible. In any system, irrespective of distance, the use of different wave lengths for transmission and reception at a given station makes it more difficult for one person to overhear the whole of a conversation.

(*e*) There are no insuperable difficulties in the system being worked satisfactorily in connection with the ordinary trunk lines, and, as far as subscribers are concerned, the conversation can take place exactly as with the land line system, *i.e.*, the subscriber has not to install in his office any special apparatus or to manipulate any switches during a conversation.

The solution of the practical difficulties of the commercial application of radio telephony outlined above depends largely on the use of short waves. The system is thus limited to comparatively short ranges, and the achievements of this line of development cannot be extended to radio telephonic communication at longer distances without resorting to longer wave lengths with the consequent elimination of the slight degree of secrecy the use of short waves at present gives. The absence of interference with short waves is mainly due to the fact that these wave lengths are not greatly used at present for radio communication. The increased use of such wave lengths would probably cause mutual interference to nearly the same extent as is now experienced with longer wave lengths.

The Committee cannot recommend the use of radio telephony as a substitute for any other means of telegraphic communication except in those cases where the special requirements can be met in no other economic way; for example, the broadcasting of intelligence of general information where one costly transmitting station supplies a great number of simple, inexpensive, receiving stations, seems a practical commercial problem, especially in localities ill-equipped with land lines.

As regards future work, the Sub-Committee states that it can, if desired, examine more fully the position of radio

telephony abroad. However, from the general study which it has made of the information published in the technical Press, it hardly expects that the development of radio telephony in foreign countries has been carried much, if any, further than in this country. The Committee intimates that it can, if desired, recommend to the Radio Research Board a programme of investigation which could be undertaken with a view to the improvement and development of this means of communication.

REVIEWS.

Radiations From Slow Radium. By J. B. Kramer. With a note on their therapeutic value, by John Hall-Edwards, L.R.C.P., &c. Pp. 105; figs. 53. London: Baillière Tindall & Cox. Price 12s. 6d. net.

This book deals with the advantages of replacing in therapeutical work the very expensive radium salts by the less expensive uranium and thorium salts, the emanations of which, whilst relatively weak, are capable of much more control, and so offer advantages and less risk of radium "burns."

To such mixtures of uranium and thorium which may possibly contain an infinitesimal quantity of radium, the author has given the name "Slow Radium," but as the presence of radium is not essential a more accurate and true name would be "Uranium and Thorium Emanations."

In his preface, the author mentions that "the study of radium and its radiations has been rendered rather difficult for the medical man, owing to the fact that most books published on this subject contain intricate mathematical problems and highly abstract technicalities."

This being the case, and the use of radium having potentialities for good and evil, it is questionable whether any medical man has the moral right to employ a therapeutic agent with whose properties he is not thoroughly conversant, as far as present day knowledge permits, particularly when the mathematics necessary for radio-active theory are of a far more elementary standard than the mathematics required by a first-class electrical engineer dealing with general electrical technology.

Granting this, however, it is questionable whether such a medical man will have a very clear idea of the ratio e/m introduced on page 8.

The book consists of seven chapters, namely: Introduction; What Radio-Activity Means; The Products of Radio-Activity; How to Trace Radio-Activity; Penetrative Powers of Radium Radiations; Effects of Penetrations from Slow Radium; Summary and Conclusion; and Slow Radium as a Therapeutic Agent.

One may say that the first five chapters give a description of radio-activity of the "popular" type, such as may be obtained from any good "popular science" book or magazine.

Chapter VI gives various photographs comparing the penetrative powers of pure and slow radium, and is, therefore, of interest to those who may use "slow" radium.

In Chapter VII, we appear to reach the nucleus of the book, since this chapter deals with the "Standard Kramer Applicators" and shows various photographs of their application to nœvus of face, dermatitis of scapula region, lupus of forearm, neoplasm of breast, neuritis of shoulder, keloid of leg, lumbago of back, arthritis of ankle, and papillomatous growth of plantar aspect of foot. The varieties of disease to which slow radium is applicable leaves one with the impression that "slow" radium is the present-day elixir *vita*.

The book concludes with a general statement by Dr. Hall-Edwards, on the possible applications of "slow" radium, who states that his interest is purely scientific, but urges the trial of the applicators by dermatologists for chronic and intractable skin disease.

The book is only just over 100 pages of large type, and is very artistically got up, in fact, more artistically than usual with a book of this type, and its price being high, one is left with the impression that its chief use will be for propaganda purposes in connection with "Standard Applicators."

B. J. L.

Directive Wireless Telegraphy: Direction and Position Finding, &c. By L. H. Walter, M.A., A.M.I.E.E. Pp. xii+124; figs. 57. London: Sir I. Pitman & Sons, Ltd. Price 2s. 6d. net.

The various methods of directive working, and especially of directive reception, have in the last year or two assumed a very prominent place in the practice of wireless telegraphy. Of hardly more than theoretical interest before 1914, they were developed under the stress of war requirements into valuable aids to both the naval and military forces, and the methods so developed are now finding a great and a growing field of usefulness under peace conditions. The seaman and the aviator find directive wireless of great assistance in taking bearings and so finding their position when the ordinary navigation marks are invisible owing to fog. The network of long-distance lines of communication with which before long the world will be covered could not be developed to anything like the extent now proposed without the aid of methods of directional working. By these methods the transmitted signals can be confined more or less to the desired direction, and so the wasteful and harmful radiation of energy in other directions avoided, while at receiving stations interference from adjacent transmitting stations can be cut out. By this means not only is jamming reduced, but duplex working is made possible.

Directional working is, therefore, a subject with which anyone whose business brings him into contact with wireless matters should have some acquaintance. Unfortunately, it is a branch of wireless telegraphy which has not hitherto received very detailed treatment in the ordinary text-books. The literature of the subject exists mainly in the form of papers published in the proceedings of various scientific societies, and it is not everyone who has the time or the opportunity to consult these papers. In the volume under review the author, who is an expert in this particular branch of wireless telegraphy, has given a comprehensive survey of the work which has been done in the subject up to the present, and for the average wireless man little more is needed. For the benefit of any reader who wishes to go more deeply into the matter a list of references to more detailed sources of information is given at the end.

The book is divided into six chapters. In the first the general question of directive working is discussed. In the second chapter the various methods of directional transmission and reception are described. Elaborate theory is avoided, but the author does not make the mistake, so common with the authors of primers, of avoiding all theoretical discussion. Enough theory is given to enable the reader to see for himself why the various results described are produced, instead of being left to take statements on trust. In this chapter also is given a useful summary of the various formulæ connected with transmission and reception with loop antennæ, and a short note is added on the method of designing such antennæ.

The following chapter is devoted to a description of the various methods by which directive wireless telegraphy is applied to the navigation of ships and air-craft, together with a discussion of the different errors which are met with in practice.

In the fourth chapter the various types of direction-finding apparatus in actual use to-day are described. The fifth chapter is devoted to a brief description of the direction-finding stations now in operation, while in the final chapter are described some miscellanous applications of directive working, the most important of which are those designed to eliminate atmospherics.

The book is very clearly written, the illustrations are numerous and clear, and we can recommend it to anyone who is in any way interested in the subject.

Fuel and Lubricating Oils for Diesel Engines. By W. Schenker. Pp. xii+114; figs. 26. London: Constable and Co. Price 10s. net.

The presentation of a chemical subject by an engineer is perhaps a little novel, but as the book is written for engineers it has the advantage of being viewed from the engineer's standpoint. The book is intended for owners and engineers in charge of Diesel engines. It deals with liquid fuels in general, their origin, composition, and preparation for use. Special attention has been devoted to Diesel fuel oils proper, and it has been thought useful to give specifications of qualities, also directions for carrying out simple tests. The lubricating oils are so nearly related to the fuel oils that the book would have had to be considered incomplete if they had not been included.

The author being the chief engineer to the Diesel engine department of Messrs. Sulzer Frères must possess an intimate association with the subject about which he has written, but one ventures to suggest that the value of the book would have been considerably enhanced had he confined himself to some of the problems which beset many engineers, instead of dealing with some of the side-tracks of petroleum technology.

It is obvious that there are many types of fuel which can be used in Diesel engines, but there are no doubt some merits or demerits attached to at least some of them, but the author gives no guidance in this direction, neither does he give any pronouncement upon the special characteristics of the lubricating oils to be used. It is quite insufficient merely to state the viscosity and flash point of the oil, for it is generally acknowledged that such a brief specification gives but little guarantee of the suitability of the oil for the purpose. No result of oil tests in the several types of engines are given. The best oil for one engine may not be the best for another, especially is this the case with the lubricating oil. The influence of the design of the flame plate upon the burning of the fuel, and the interpretation of the indicator cards obtained would have been welcomed.

The significance of the special gravity of oils is somewhat over-estimated, in fact one is led to suppose that this physical constant is of primary importance, but the author cannot have meant this, because on page 86 he reveals the fact

that the correlation between specific gravity and calorific value only exists between oils of the same origin, *e.g.*, the crude oil from a Pennsylvanian well would give rise to various fractions ranging in specific gravity from about 0.7 to 0.92, and each fraction would show a certain continuity in its physical constants, likewise, the fractions of a Californian oil would show a similar continuity, but it is highly improbable that two fractions from dissimilar crude oils would possess the same physical constants even if their specific gravities were the same.

The popular topic of the sulphur content is dismissed in about two lines. When one engineer has trouble with an oil containing a few per cent. of sulphur and another experiences no trouble with an oil with a 40 per cent. sulphur content, engineers would like to know the reason for it.

On page 22 the term "liquidity" could well be changed to "fluidity" and on page 27 the words "cracking naphtha" might be revised.

Except for the typical analysis on page 44, there are not any specifications for fuel oils given, although in the preface they are stated to be included. Certain properties are described, but not a word about the asphalt content is given.

The lubricating oils described on page 60 may be suitable on the Sulzer engines, but they do not apply to other makes of Diesel engines. Surely it would be erroneous to lubricate a large Burmeister & Wain Diesel engine with a superheated steam cylinder oil.

It is hoped that these helpful criticisms will not minimise the comforting forecast of the supplies of oil in the future, which is very admirably estimated, nor the valuable graphs and tables which have been inserted. The art of evading chemical nomenclature is amply manifested in this chemical book written by an engineer and should, therefore, be heartily welcomed by engineers.

The Mechanical Handling of Goods. By C. H. Woodfield, M.I.Mech.E. Pp. xi+116; 73 illustrations. London: Sir Isaac Pitman & Sons. Price 2s. 6d. net.

The problem of transport within factories and works is one that received great attention during the recent war period, when the supply of manual labour was so very limited. With the continual demands for increased production being accompanied by the withdrawal from industry of large quantities of general labour, it became more and more important that all the manual labour available should be employed to the very best advantage, necessitating that man-handling should be replaced, wherever possible, by the use of mechanical devices. The extent to which such appliances have been developed is well indicated in the above little book, which gives much interesting information concerning the methods and equipment employed.

After a brief discussion of the general scope of goods-handling machinery, and of the extent to which capital outlay thereon is justifiable, the book devotes three chapters to the description of various forms of lifting gears, such as rope, chain, and worm-geared pulley blocks, crab winches and derricks, and friction hoists. The four succeeding chapters describe overhead runways, travelling cranes, electric mono-rail hoists, self-landing and delivery hoists, cantilever and transporter cranes. A separate chapter is occupied by a brief but excellent description of electric storage battery trucks, which are now so frequently seen in use at large railway termini. Continuous conveying apparatus and useful adjuncts thereto are described in Chapters 10 to 12, including gravity roller runways, sack and spiral shoots, "humpers" and "pushers," stacking machines (including a type devised by the author), band, bucket, worm and tray conveyors, machines for raising and lowering sacks, coke and ash handling plant. The last chapter is devoted to portable jib cranes and runway accessories, and would be in a more logical position if it followed Chapter 8.

With the small space available the book cannot possibly be comprehensive, neither can the various items be treated with much detail. The scope is fairly wide, however, and the descriptions are good, while the many illustrations are excellent, and the book gives an interesting survey of appliances to which little more than casual notice is usually given. Much useful information is given as to the capacities and speeds, &c., of the various machines described, and of the extent to which labour charges may be reduced by their employment.

The object of the book being frankly descriptive, the few calculations included (which deal mainly with lifting gears) are of secondary importance, but certain points are open to criticism, such as the use of the words "power" and "power ratio" to mean "effort" and "velocity ratio" respectively, on pp. 10 and 16, and the neglect of the effect of friction on the formulæ on pp. 16-17. The worked example in the middle of page 17 is peculiar—a winch problem is worked using a ¼-in. steel rope on a 5-in. diameter barrel, but a footnote is added stating that this size of barrel is only suitable for manila rope, and that steel rope would require a much larger barrel. There appears to be no reason why practical conditions should not have assumed in the first instance.

Typographical errors appear to be remarkably few, only one having been noticed so far, viz., the spelling of "over-lowering" in line 3, page 54.

COMPARATIVE TESTS ON TRAMCARS.

Roller *versus* Plain Bearings.

At the recent annual convention of the Tramways and Light Railways Association, during the discussion on a paper that dealt with the subject of modern improvements in rolling stock, several speakers referred to the advantages of using roller and ball bearings on tramcars in place of the ordinary plain pattern of bearing.

It is, therefore, appropriate to draw attention to the comparative tests for electric power consumption, tractive resistance, &c., on tramway cars that are mentioned in the director's annual report on the work of the National Physical Laboratory during 1921.

A series of tests was carried out by the Engineering Department of the N.P.L. for the Hoffmann Manufacturing Co., Ltd., Chelmsford, on two double-deck tramcars, one of which had the main axle and the motor bearings fitted with Hoffmann roller bearings, the other car being fitted with plain bearings of the ordinary pattern. The cars selected for the tests were made by the English Electric Co., Ltd., Preston, and were fitted with "Brill" pattern trucks of standard type. The cars were the property of the Wigan Corporation, and the tests were made in Wigan and the vicinity.

The apparatus used for the test consisted of a recording Elliott voltmeter and a recording ammeter specially fitted with electro-magnetic time pens, the draw-bar dynamometer designed at the Laboratory, and specially fitted with apparatus for measuring and recording pulls down to 10 lb., and a sprung distance recording wheel, which was attached to the rear buffer beam of the car under test.

The electrical instruments were arranged with a paper speed of from 6 to 9 in. per minute in order that an open diagram could be obtained, and both were fitted on the end panel of the car under test so that the recording pens moved in a direction at right angles to the direction of motion of the car. For measurements of tractive resistance the pressure unit of the dynamometer was connected between the car to be tested and a hauling car, and the record paper was driven by a small electromotor operated by means of a storage battery.

The distance wheel was provided with three commutators with one, four, and eight contacts respectively, and a single slip ring. The commutators and slip ring were connected through a battery and selector switch to a magnetic pen which enabled indications to be made on the record paper every one eighth, one quarter, or every whole revolution of the wheel, corresponding to 1/8,000, 1/4,000 and 1/1,000, respectively, of a mile travelled. Time indications were made every half-second or every five seconds, as desired.

The same clock was used to indicate the time on both the dynamometer and the electrical instruments, and from the records obtained the time, distance run, speed, acceleration or retardation, voltage, current, and draw-bar pull were determined. For comparative tests on service runs the cars were loaded with sand bags and run separately, over a route having variable gradients, to a terminus some two and a half miles distant. The following results were obtained:—

	Test No.	Car.	Consumption, units per car-mile.	Reduction % in favour of Hoffmann car
Unloaded cars ...	1	Hoffmann	1·69	30·5
	2	Ordinary	2·43	
Loaded cars ...	3	Hoffmann	1·82	22·2
	4	Ordinary	2·34	
Loaded cars with frequent stops	5	Hoffmann	1·16	22·1
	6	Ordinary	1·49	

Wtih regard to the weather conditions when the above test results were obtained, it should be pointed out that during test No. 1 there was rain at intervals and the rails were wet, while when test No. 2 was made there was heavy rain and the rails were flooded. Fine weather prevailed whilst tests Nos. 3 and 4 were being carried out, but the former was made on dry rails and the latter on wet ones. The weather was also fine when test No. 5 was made on dry rails, but during test No. 6 rain fell and the rails were flooded.

The tractive resistance tests gave the results recorded below:—

(1) Loaded cars—				
Speed, m.p.h.	4	6	8	
Reduction in tractive resistance in favour of Hoffmann car, %	20.5	22.7	21.4	
(2) Unloaded cars—				
Speed, m.p.h.	4	6	8	10
Reduction in tractive resistance in favour of Hoffmann car, %	24.0	22.3	21.6	21.0

The static friction tests were made at various loads and the results obtained showed that the starting effort required for the Hoffmann car was 1/20 that of the ordinary car.

Retardation tests were made and the retardation determined from speeds up to 20 miles per hour. It was found that the Hoffmann car would run 57 per cent. further than the ordinary car after the supply of power was shut off at the same speed.

LEGAL.

G. B. Carpenter *v.* C. A. Carpenter, Ltd.

In the Mayor's and City of London Court, on August 1st, George Bertram Carpenter, electrical engineer, claimed £36 15s. against C. A. Carpenter, Ltd., electrical engineers, 9, Coleman Street, E.C., for 10 per cent. commission on business introduced whilst he was in the company's employment. Mr. Eddy appeared for the plaintiff and Mr. Powell for the defendants.

Mr. Eddy said that prior to March of last year plaintiff's brother, Charles Augustus Carpenter, was carrying on business on his own account as an electrician. In March of last year the defendant company was formed to take over the business of C. A. Carpenter, he and his wife being permanent directors. The defendant company specialised in a burglar alarm, and from February until June plaintiff acted as the representative of the defendant company, and he was to be paid 10 per cent. commission on the turnover. In February defendants were doing scarcely any business, but as a result of plaintiff's work the turnover became £130 a week. Plaintiff introduced the burglar alarm to Lloyd's, insurance companies, and others. Plaintiff had advanced more than £1,000 to his brother. Plaintiff had received part of the commission due to him, leaving the balance sued for due. A counter-claim of £21 had been raised for electrical work done at the plaintiff's house at Hendon. That was to have been set off against the interest due to plaintiff for his loans to C. A. Carpenter.

Mr. Powell said he admitted owing plaintiff £18, and the plaintiff owed the company £21.

After consultation judgment was entered, by consent, for the plaintiff for £20 on the claim and on the counter-claim the Judge observing that that was the sum he should have suggested, and he was very glad the case had been settled.

Boden *v.* Davis.

In the Mayor's and City of London Court, on August 1st, before Judge Jackson, Mr. Leslie J. Boden, 840, Winchester House, London Wall, E.C., sued Mr. H. E. Davis, electrical engineer, 11, Sun Street, for £44 balance of account for office accommodation supplied, and clerical and accountancy work done by him at £1 a week in connection with "Delcoblast," a chemical material for obscuring glass. Mr. Beasley appeared for the plaintiff and Mr. James Duncan for the defendant.

Mr. Beasley stated that towards the latter part of 1919 the defendant approached one Kirby to do the business work in connection with the manufacture of "Delcoblast" at South Street, where he carried it on. For some months Kirby did it for nothing. He then became too busy and defendant asked Kirby to find some one to do the work. In May, 1920, Kirby brought plaintiff to the defendant's office. Kirby and Boden were partners, and it was arranged that the plaintiff should carry on the work of keeping the books and generally looking after the business of the defendant. Plaintiff was to be paid £1 a week. Defendant's name and "Delcoblast" were put up at the plaintiff's office. Plaintiff did the work and kept the various accounts. From time to time he was paid £31 on account, and the balance claimed was due. Plaintiff drew the necessary cheques, all of which were signed by the defendant. The business did not pay and the office work was moved to the defendant's premises.

Plaintiff said that Davis, the defendant, and one Cahan each put up £100 to carry on the business of "Delcoblast." There was no arrangement that Kirby was to get 20 per cent. of the profits, Cahan 40 per cent., and the defendant 40 per cent.

Defendant said he never agreed to pay the plaintiff £1 a week or any sum. He looked upon the plaintiff as Kirby's clerk, and Kirby was to have had 20 per cent. of the profits of the sale of "Delcoblast." The business was unsuccessful and the £200 capital was lost. He signed the cheques without having any explanation as to what they were for. More than half were signed in blank.

Judge Jackson thought it extraordinary that the defendant should have signed the cheques in blank. The books were all against the defendant. Judgment was given for the plaintiff, with costs.

Electrician Sentenced for Fraud.

An electrician named Frank Sinclair Ormonde (52) appeared at the Liverpool Sessions on August 3rd on a charge of obtaining £600 by false pretences from John Alfred Scallon in October last. For the prosecution, it was stated that Mr. Scallon came into contact with prisoner through an advertisement inserted by a partnership agency. Ormonde described himself as an electrical installation contractor, carrying on business at 125, Islington, and said he wanted a partner to pay £250 for the goodwill, and to invest £350 in the business. They were each to draw a salary and equally share the profits. When Mr. Scallon visited the works he asked for a balance sheet. He received one, and on October 8th he received another balance sheet from the auditor, and on the strength of that and other documents he was satisfied that it was worth his while to put his money into the business. In the balance sheet, under the assets, were sundry debtors representing £772, and it was in connection with this item that the present charges were brought. Mr. Scallon handed over £250, and later £350, and started work with the company. He noticed that some small jobs were dealt with, but nothing of any importance, and he examined the books. In the day-book he noticed three items of £26, £22, and £180 outstanding against two firms, and after making inquiries complained to the prisoner. When prisoner was arrested and charged he replied: "My auditor is to blame. He kept my books." The accountant said that he had taken the balance sheet from the books, which were shown to him by the prisoner. He was not responsible for the care of the books. With regard to the item of £180 shown as due, it seemed to him a large amount for the business, and he asked the prisoner about it; he replied that it was a good debt. The books were loosely kept. Prisoner was sentenced to six months' imprisonment in the second division.

Marconi's Wireless Telegraph Co. *v.* Mullard Radio Valve Co.

Mr. Justice P. O. Lawrence, in the Chancery Division last week, continued the hearing of this action, brought by the plaintiffs for an injunction to restrain the defendants from infringing their Letters Patent Nos. 28,412, of 1913, and 126,658, the first granted to the company and Mr. Henry Joseph Round for an alleged invention of "improvements in receivers for use in wireless telegraphy," and the other relating to a patent granted to Michel Peri and Jacques Biguet for "improvements in or relating to vacuum tubes."

The defence was a denial of infringement (*vide* Electrical Review, July 28th, p. 121).

Dr. W. H. Eccles, called for the defendants, said he was adviser to the Admiralty on matters connected with wireless telegraphy. He understood that Round's patent related to a particular construction of the De Forest three-electrode vacuum tube with cylindrical grid and cylindrical anode characteristically by themselves, that the grid entirely separated the filament space from the anode space, and that the cylinder separated the filament from the glass. Witness thought that what the defendants had done did not constitute infringement. Cross-examined, he did not say that Round's patent was devoid of merit. He thought that it possessed the merit of keeping the electrons off the glass in a soft valve, and yet retaining Lebins's improvements upon De Forest.

Counsel for the respective parties having addressed the Court, his Lordship said he would deliver his judgment next term.

Judgment was accordingly reserved.

Telegraph Concessions in Brazil.—Decrees signed on April 7th and 8th by the President of Brazil approve the following telegraph and cable developments, says the *Financier*.—(1) Plans of the All-America Cables (Inc.) for overhead telegraph lines and cable stations in Sao Paulo and Santos; (2) similar plans in the same cities submitted by the Western Telegraph Co.; (3) petition of Enrico Sehoch for permission to organise a company for the construction and operation of cables from Rio to Rome and from Rio to Monte Video. The authority granted Enrico Sehoch specifies that the proposed company shall enjoy no special privileges, monopoly or subvention in Brazil, states a report published by the U.S. Department of Commerce. The new company is a further development of the plan for a cable from Italy to Brazil, the Italian concession having been obtained last September. This last concession gives the Compagnia Italiana dei Cavi Telegrafici Sottomarini the right to lay and operate, for a period of 50 years, cables to Greece, Spain, the Canary Islands, the Cape Verde Island, Brazil, Uruguay, and Argentina, and specifies that during that period the Italian Government will not grant cable rights to any other company, Italian or foreign, without first notifying the Compagnia Italiana dei Cavi and giving it the opportunity to furnish the service proposed.

There is no obstacle to the granting of cable concessions in Uruguay, and recent developments in Argentina make it probable that the Italian company will encounter little difficulty there. The date set for the completion of the cable from Italy to South America is January 27th, 1925. The Western Telegraph Co., on April 21st, opened to the public its new cable giving direct service between Rio and Maceió. Several months ago the Brazilian Government granted to the All-America Cables a new concession for a cable from Rio to Buenos Ayres. The previous concessions to that company covered cables from Buenos Ayres to Monte Video and from Rio and Santos to Monte Video, but no authority had been granted for a direct cable from Brazil to Argentina. It will be possible for the company to make the direct connection from Rio to Buenos Ayres by cutting the Monte Video-Rio cable in the River Plate and diverting it to Buenos Ayres, but if this is done a new coastal cable between Santos and Rio will probably be necessary. With these rearrangements a flexible system for communication between the three republics will be produced, and the service to the West Coast and to North America will be improved.

NEW PATENTS APPLIED FOR, 1922.

(NOT YET PUBLISHED.)

Compiled expressly for this journal by MESSRS. SEFTON-JONES, O'BELL AND STEPHENS, Chartered Patent Agents, 285, High Holborn, London, W.C. 1.

20,158. "Method of exploding bombs discharged from aircraft by wireless telegraphic waves." C. R. Jarman. July 24th.
20,161. "Electric transmission systems." A. M. Taylor. July 24th.
20,170. "Conducting wires for electrical apparatus." W. Picard. July 24th.
20,173. "Wireless telegraphic, &c., receivers." D. S. F. Adams. July 24th.
20,181. "Automatic, &c., telephone switching systems." W. Aitken. July 24th.
20,209. "Electric heating units." British Thomson-Houston Co., Ltd. (General Electric Co.). July 24th.
20,243. "Glareless lamps." A. V. Cassels, J. A. Paton, H. Richards, and O. A. Townsend. July 24th. (Australia, September 13th, 1921.)
20,253. "Spark plugs." A. de Claremont. July 24th.
20,258. "Wireless aerials, &c." H. M. Lucy. July 25th.
20,304. "Antenna for underwater wireless telegraphy, &c." L. S. Palmer and L. G. Preston July 25th.
20,336. "High-frequency signalling systems." British Thomson-Houston Co., Ltd. July 25th. (United States, April 18th.)
20,337. "Wireless telegraphy and telephony." G. A. Irving, L. G. Preston and G. Shearing. July 25th.
20,348. "Anti dazzle devices for vehicle lamps." R. G. Newhall. July 25th.
20,350. "Electrodes and method of manufacturing same." J. P. Scott. July 26th.
20,351. "Electrodes and method of manufacturing same." J. P. Scott. July 25th.
20,352. "Electrolytic cells." J. P. Scott. July 25th.
20,361. "Means for interconnecting electrical lines in telephone plants, &c." Relay Automatic Telephone Co., Ltd. July 25th. (Sweden, October 15th, 1921.)
20,365. "Jewel bearings for rotary elements of electric meters." G. A. Chgetham, Metropolitan-Vickers Electrical Co., Ltd., and W. Smethurst. July 25th.
20,393. "Synchronous electromotors for charging accumulators by alternating current." J. Bregi. July 26th.
20,410. "Electric motors, dynamos, &c." C. F. Davies, J. H. Taylor, and W. E. Taylor. July 26th.
20,421. "System for distant control of direct-current electric motor." F.I.A.T. Soc. Anon. July 26th. (Italy, August 9th, 1921.)
20,423. "Drive of electric power producing machines." D. H. Savage and J. A. Savage. July 26th.
20,443. "Insulation of electric cables." C. J. Beaver (Executor of E. A. Claremont), A. W. Claremont (Executor of E. A. Claremont), E. A. Claremont, L. B. Claremont (Executor of E. A. Claremont), and W. T. Glover and Co., Ltd. July 26th.
20,452. "Dynamos for train lighting, &c., installations." A. H. Darker and J. Stone & Co., Ltd. July 26th.
20,458. "Arrangement for suspending overhead wires on electric railways, &c." Sir P. Dawson and F. W. Fawdry. July 26th.
20,459. "Device for supporting overhead wires for electric railways, &c." Sir P. Dawson and F. W. Fawdry. July 26th.
20,460. "Electro responsive devices." British Thomson-Houston Co., Ltd., and A. S. Fitzgerald. July 26th.
20,461. "Electric arc welding apparatus." British Thomson-Houston Co., Ltd. July 26th. (United States, July 26th, 1921.)
20,462. "Dynamo-electric machines." British Thomson-Houston Co., Ltd. (General Electric Co.) July 26th.
20,471. "Regulating devices for high intensity arc lamps." H. L. M. J. Benard. July 26th.
20,476. "Electric circuit controllers." F. R. McBerty. July 26th. (United States, August 10th, 1921.)
20,478. "Circuit controllers." R. C. Arter. July 26th. (United States, September 8th, 1921.)
20,479. "Ringing control systems." A. W. Clement. July 26th. (United States, August 10th, 1921.)
20,483. "Devices for transmission of electric currents between relatively movable solid conductors." R. Erban and A. Madle. July 26th. (Austria, July 26th, 1921.)
20,485. "Manufacture of plates of electric storage batteries, &c." O. Reynard, F. F. Tapping and F. C. Thornley. July 26th.
20,493. "Device for locking electric lamp globes in holders." A. Wilkinson. July 27th.
20,499. "Electro mechanical typewriter." E. P. Hall. July 27th.
20,526. "Telephone, &c., head instruments." Dictograph Products Corporation and E. W. Pattison. July 27th.
20,528. "Machines for winding electric coils." Dictograph Products Corporation and E. W. Pattison. July 27th.
20,529. "Telephone receivers." Dictograph Products Corporation and E. W. Pattison. July 27th.
20,546. "Removable shutters for electric alarm systems." G. B. Carpenter. July 27th.
20,555. "Impulse sending devices for automatic telephone systems, &c." W. Stott, Telephone Manufacturing Co., Ltd., and A. F. Wood. July 27th.
20,563. "Protective arrangements for alternating electric current circuits." R. W. Biles and A. Reyrolle & Co., Ltd. July 27th.
20,568. "Electric circuit systems for wireless telegraphic, &c., receiving apparatus." W. J. Rickets. July 27th.
20,571. "Electric induction coils." N. E. Dobbin, S. L. Forbes, and J. W. Fothergill. July 27th.
20,572. "Loud speakers for wireless installations." N. E. Dobbin, S. L. Forbes, and J. W. Fothergill. July 27th.
20,574. "High-frequency signalling systems." British Thomson-Houston Co., Ltd. July 27th. (United States, July 27th, 1921.)
20,576. "Radio receiving devices." Capitol Phonolier Corporation. July 27th. (United States, June 2nd.)
20,579. "Electric controller." Ward Leonard Electric Co. July 27th. (United States, July 29th, 1921.)
20,592. "Controlling device operating by the aid of a relay." Aktiebolaget Vaporackumulator. July 27th. (Sweden, July 29th, 1921.)
20,580. "Resistance devices." Ward Leonard Electric Co. July 27th. (United States, March 27th.)
20,581. "Resistance devices." Ward Leonard Electric Co. July 27th. (United States, March 28th.)
20,599. "Combined packing crates and stands for electric storage batteries." Fuller's United Electric Works, Ltd., and J. P. Mansfield. July 27th.
20,600. "Publicity sign telegraphs." H. K. Harris. July 27th.
20,601. "Telephone exchange systems." G. Deakin and Western Electric Co., Ltd. July 27th.
20,624. "Artificial illumination." P. Beeston and J. A. Lambert. July 27th.
20,632. "Electric microphones." B. A. Pilkington. July 28th.
20,633. "Electric device for indication of vacant seats in kinemas, &c." G. B. Banks. July 28th.
20,639. "Distribution of electricity." T. Cooper. July 28th.
20,673. "Electro-magnetic apparatus for steering vehicles." J. G. Gray. July 28th.
20,685. "Wireless tuning coils." J. Lipousky. July 28th.
20,691. "Induction motors." H. C. E. Houtard. July 28th. (Germany, July 29th, 1921.)
20,705. "Systems of electric distribution." British Thomson-Houston Co., Ltd. (General Electric Co.). July 28th.
20,737. "Burglar alarm systems." G. B. Carpenter. July 28th.
20,751. "Glands for junction boxes." Macintosh Cable Co., Ltd., and D. D. Watson. July 28th.
20,753. "Electric switches." W. C. Davey and D. White. July 28th.
20,767. "Adjustable electrical rheostats, inductances, &c." W. A. Brooke. July 29th.
20,771. "Mast for aerial wires used in wireless telegraphy." F. H. Armstrong. July 29th.
20,810. "Alternate-current electricity." A. E. Salisbury and M. J. E. Tilney. July 29th.
20,811. "Apparatus for testing and improving high-tension spark circuit of internal-combustion engines." A. Hewlett. July 29th.
20,813. "Wireless receiving apparatus." C. S. Agate. July 29th.
20,818. "Treatment of magnetic materials." Western Electric Co., Ltd. (Western Electric Co., Inc.). July 29th.
20,819. "Loaded electric conductors." Western Electric Co., Ltd. (Western Electric Co., Inc.). July 29th.
20,825. "Electric switches." O. Lucas. July 29th.

PUBLISHED SPECIFICATIONS.

The numbers in parentheses are those under which the specifications will be printed and abridged, and all subsequent proceedings will be taken.

1920.

30,775. "Electrical heating and cooking apparatus." G. Pate and J. R. Laird. July 30th, 1921. (182,822.)

1921.

1,156. "Electric motors." Traun's Forschungslaboratorium Ges. H.O. January 10th, 1921. (157,262.)
1,157. "Process and apparatus for converting static atmospheric electrical energy into dynamic electrical energy of any suitable high periodicity." Traun's Forschungslaboratorium Ges. H.O. January 10th, 1921. (157,263.)
1,317. "Automatic electric switches." H. Bollinger. August 19th, 1913. (157,396.)
1,329. "Means for modulating the periodicity and potential of alternating current supply." Ges. für Drahtlose Telegraphie. December 24th, 1919. (157,408.)
2,688. "Sound-recording or sound-reproducing machines." Plantation Rubber Manufacturing Co., Ltd., and M. M. Dessau. January 20th, 1921. (182,836.)
2,783. "Telephone systems." Western Electric Co., Ltd. (Western Electric Co., Inc.). January 21st, 1921. (182,839.)
4,958. "Connection system for electric transformers." G. Campos. February 12th, 1920. (159,136.)
7,423. "Telegraph or telephone systems, with amplifiers." H. A. Gill (Deutsche Telephonwerke Ges.). March 8th, 1921. (182,853.)
7,561. "Differential method and device for the electrical navigation of ships." Signal Ges. March 12th, 1920. (159,903.)
8,047. "Dry storage batteries." W. Gardiner. March 15th, 1921. (182,865.)
8,141. "Circuit arrangements for multiplex cable telegraphy and telephony." H. A. Gill (Deutsche Telephonwerke Ges.) March 15th, 1921. (182,867.)
9,501. "Means for detecting faults or breaks in submarine electric cables." F. B. Young and B. S. Smith. March 30th, 1921. (182,870.)
9,950. "Method of and apparatus for receiving high-frequency electric signals." D. G. McCaa. April 6th, 1920. (Addition to 155,244.) (161,187.)
9,951. "Electro-magnetic cut-outs." La Metallurgique Electrique (Soc. Anon.) September 6th, 1920. (168,848.)
10,213. "Device for automatically making and breaking an electric circuit with the commencement and ceasing of speaking currents and similar electric oscillations." Telegraphon Ges. August 24th, 1920. (168,300.)
10,326. "Reception of radio signals." Marconi's Wireless Telegraph Co., Ltd. April 9th, 1920. (161,580.)
10,404. "Electric commutators." J. E. Calverley and W. E. Highfield. April 8th, 1921. (182,895.)
10,433. "Dynamo electric machinery." H. F. Joel, Sen., and H. F. Joel, Jun. April 9th, 1921. (Cognate application 19,830/21.) (182,896.)
10,462. "Dynamo electric machines." S. B. Morgan. April 9th, 1921. (182,898.)
10,478. "Electric voltage regulators." E. C. Wilkins. April 9th, 1921. (182,899.)
10,702. "Electro-magnetic switches." British Thomson-Houston Co., Ltd. (General Electric Co.). April 12th, 1921. (182,923.)
10,770. "Illuminated signs." Studien ges für Elektrische Beleuchtung, Dr. F. Skaupy, and A. Fehse. April 13th, 1921. (182,926.)
10,803. "Telautography." H. G. Bartholomew. April 13th, 1921. (182,928.)
10,822. "Retarding devices for electric relays." W. H. Petersen and Allmanna Svenska Elektriska Aktiebolaget. April 13th, 1921. (182,932.)
11,070. "Electric switch." A. H. Hunt. April 15th, 1921. (182,940.)
11,152. "Electric switches." Butlers, Ltd., and A. Reeves. April 18th, 1921. (182,951.)
11,427. "Telephone hand sets." Western Electric Co., Ltd., and G. Deakin. April 20th, 1921. (182,956.)
11,560. "Electro-magnetic switches or contactors." Metropolitan-Vickers Electrical Co., Ltd. April 23rd, 1920. (162,251.)
11,943. "Electric burglar alarms." G. Kirk. April 26th, 1921. (Addition to 181,171.) (182,965.)
12,181. "Electric welding and appartus therefor." W. Langdon Davies and A. Soames. April 28th, 1921. (Cognate application 34,234/21.) (182,970.)
12,386. "Electric switches." Bristol Tramways and Carriage Co., Ltd., and B. A. Payne. April 29th, 1921. (182,977.)
13,671. "Automatic reversing switch or pole-changing mechanism for dynamo electric machines." J. Stone & Co., Ltd., and A. H. Darker. May 13th, 1921. (182,996.)
14,571. "Secondary electric batteries or accumulators." B. Heap and Chloride Electrical Storage Co., Ltd. May 25th, 1921. (183,012.)
15,075. "Alternating-current electrical instruments." G. F. Shotter and E. W. Hill. May 31st, 1921. (Addition to 168,339.) (183,017.)
15,256. "Telephone systems." Automatic Telephone Manufacturing Co., Ltd. June 18th, 1920. (165,030.)
16,010. "Electric terminals." P. B. Handley. June 10th, 1921. (183,022.)
17,073. "Fireproof holders for half-watt electric lamps and the like." H. C. Tudor. June 22nd, 1921. (183,027.)
18,955. "Apparatus for controlling the relative speeds of motors, or other driven devices." Igranic Electric Co., Ltd. (Cutler Hammer Manufacturing Co.). July 13th, 1921. (183,036.)
19,369. "Rotary converters." Igranic Electric Co., Ltd. (Cutler Hammer Manufacturing Co.). July 18th, 1921. (183,037.)
19,744. "Electrolysis of solutions and apparatus therefor." Hooker Electrochemical Co. August 5th, 1920. (167,469.)
19,940. "Electric protective systems." Akt. Ges. Brown, Boveri et Cie. July 31st, 1920. (167,170.)

1922.

2,358. "Induction motors for alternating electric current." Crypto Electrical Co., Ltd., and H. G. Sharp. January 25th, 1922. (183,095.)
8,372. "Alternating-current rectifying apparatus." H. Andre. March 26th, 1921. (177,531.)
14,830. "Electric lighting and starting installations for motor vehicles." R. Bosch Akt. Ges. May 30th, 1921. (180,687.)
16,490. "Switches of the quick make and break type." J. B. Tucker. April 2nd, 1921. (Divided application on 182,553.) (183,109.)